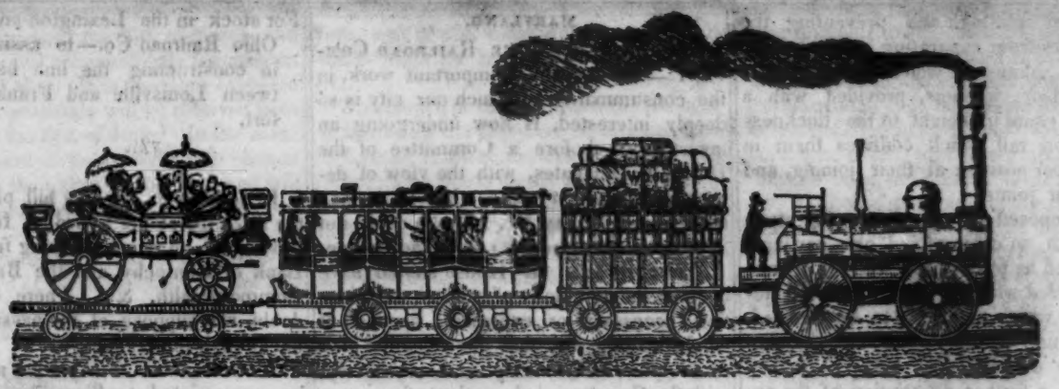


AMERICAN RAILROAD JOURNAL,
AND ADVOCATE OF INTERNAL IMPROVEMENTS.

PUBLISHED WEEKLY, AT NO. 30 WALL STREET, NEW-YORK, AT FIVE DOLLARS PER ANNUM, PAYABLE IN ADVANCE

D. K MINOR, and GEORGE C. SCHAEFFER, {EDITORS AND PROPRIETORS.} SATURDAY, FEBRUARY 20, 1836. [VOLUME V—No 7.

For the Railroad Journal.

BALTIMORE, 16th Nov. 1835.

D. K. MINOR, Esq.,

Sir,—The subscriber, having invented an improved Rail-track, and also an improved Railroad Car-wheel, is desirous, through the medium of your columns, to make known the general outlines of his plans, and when his leisure will permit, a more detailed specification of them.

Improved Rail-track.

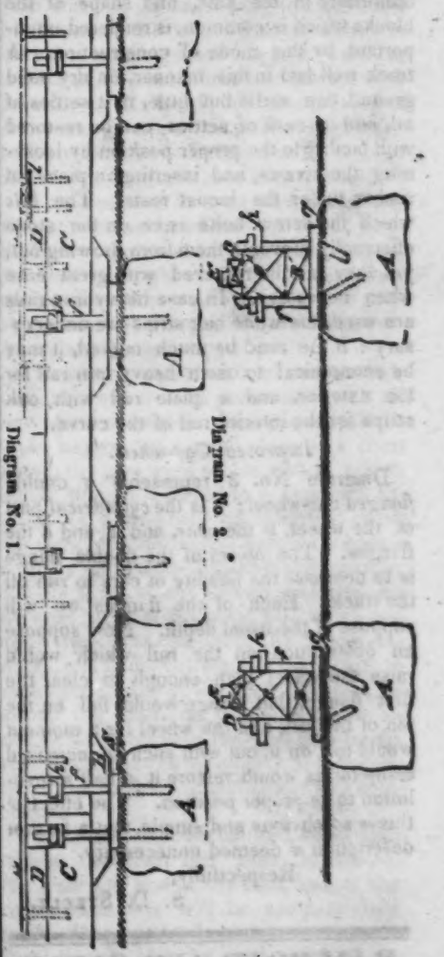
Various plans have been adopted in the United States for the construction of Rail-tracks, each of which has its respective advantages, and disadvantages and so obvious is it that the advantage which one possesses over the other, is gained by the sacrifice of some principle which it is desirable to maintain, that it is difficult, if not impossible, to decide which is in the whole superlatively good.

Some Engineers contend for the superiority of tracks made entirely of stone and iron, and rest their opinions on the important fact of using no perishable materials. Others believe that tracks made wholly of wood and iron are generally the best, on account of their lesser first cost, and wear of the machinery which plies upon them.

The objections to the former plans are their unyielding nature, and their liability to short settles. To the latter, their want of stiffness, and the perishable nature of their component parts.

In the construction of Rail-tracks, it is desirable—First, That their bearings should be of uniform solidity; second, That the rails which rest upon them should have their joints perfectly broken, so that the weight of each car passing over them, may at all times be distributed on at least three supports; third, That the foundations should be of unperishable materials, and no part of them above the surface of the ground, so that they may be stable, and not interfere with the formation of a horse-path, where one is necessary; fourth, That there should be in them some spring, but not enough to make a perceptible increase of motive power necessary; fifth, That any wood which is used in their construction should be elevated above the surface of the ground, its durability being decreased one-half by coming in contact with it; sixth That the verticle pressure of the cars should be nearly over the centres of the bearings and rails, so as to prevent a disposition to tilt; seventh, That the rails should be occasionally tied, so as to counteract the disposition to spread; eighth, That they should be so constructed as to offer the greatest possible facilities for adjustment. Many of the tracks which have been constructed possess some of these desiderata in great perfection; by one of the following description, it is believed that they all may be obtained at a moderate expense.

Diagram No. 1 represents a longitudinal, and diagram No. 2, a transverse section of the rail-track. A, A, &c. are stone blocks bedded in sand or gravel, three feet apart from centre to centre longthwise of the track, and every fifth one extending entirely across the track. Their tops coincide with the surface of the ground. After they have been brought to a bearing with a common maul, they are to be consolidated by raising a given weight a given height, and letting it fall a given number of times on each block; the degree of consolidation to depend on the texture of stone. B, B, &c., locusts rests, 1 foot 9 inches long, by 6 inches wide, by 3 or 4 inches deep, the depth to regulate the level of the upper surface of the rails. C, C, &c., 6 by 6 inch southern yellow pine, strong pieces. D, D, &c., 2 by 3 inch seasoned white oak strips. F, E, &c., iron plate rails, spiked with 5 inch spikes to the timber below them. E, F, &c., inch screw bolts, bent at their lower ends and inserted in oblique holes drilled for their reception in the stone blocks, the holes nearest the centre of the track to be 6, and those farthest from it 4 inches deep. G, G, &c. iron plates 10 inches square, by ¼ an inch deep, preventing the screw bolts from approaching each other at their bases, and affording a smooth bearing for the locust rests. H, H, &c., iron caps 2¼ inches wide by ¼ an inch thick, confining the oak strips in their right position on the string, preventing



them from splitting, and preventing the screw bolts from separating at their tops. I, I, &c., plates on which the plate rails rest at their joinings, provided with a shoulder equal in height to the thickness of the iron rail, which confines them in their proper position at their joining, and hooks their joints.

It is proposed to consolidate the stone blocks with an engine fixed on a carriage, so arranged as to raise two weights at once and provided with an *anchor* fixed in advance, to which a cord is to be attached, from a drum on the engine, by means of which the carriage can easily be moved forwards: a further description of the engine is deferred for the present. It is believed that great advantage will result from this mode of consolidating the blocks, and that it is the only mode by which they can be got of uniform solidity. What slight dressing is necessary for the reception of the plates may be done after they are down, and it will be perceived that a variation in their height will only involve the necessity of varying the length of the screws, and the thickness of the locusts rests. That uniformity in the size, and shape of the blocks which is common, is rendered unimportant by this mode of construction. A track well laid in this manner, on dry solid ground, can settle but little, if it settles at all, and in case of settles can be restored with facility to the proper position by loosening the screws, and inserting a piece of timber under the locust rests. The *bite* which the screw bolts have on the stone effectually prevents them from drawing out, yet they can be removed with great ease when necessary. In case heavy iron rails are used, the white oak strips are unnecessary: if the road be much curved, it may be economical to use a heavy iron rail for the exterior, and a plate rail with oak strips for the interior rail of the curve.

Improved Car-wheel.

Diagram No. 3 represents a double *flanged* car-wheel; *a* is the *cylindrical* part of the wheel, *b* the *cone*, and *c* and *d* the flanges. The object of the double flange is to decrease the liability of cars to run off the track. Each of the flanges we will suppose of the usual depth. Now suppose an obstruction on the rail which would raise the wheel high enough to clear the first flange, that flange would fall on the top of the rail, and the wheel for a moment would roll on it, but with such an increased diameter as would restore it in half a revolution to its proper position. The effect of this is so obvious and simple, that a further description is deemed unnecessary.

Respectfully,

S. D. Steele.

RAILROAD AND CANAL INTELLIGENCE.

NEW-JERSEY.

Much interest is excited throughout the State by the proposed purchase of the Camden and Amboy Railroad and Delaware and Raritan Canal. The subject is now before the Legislature.

MARYLAND.

The Port-Deposite Railroad Company.—This great and important work, in the consummation of which our city is so deeply interested, is now undergoing an investigation before a Committee of the House of Delegates, with the view of determining whether some other route than the one selected by Mr. Latrobe could not have been occupied with equal advantage.

We regret that the House should have deemed the ceremony of such an examination necessary or expedient, because it would seem to us, that the selection of a route must rest, entirely and exclusively, with the Company, independent of any control, except the expressed restrictions of its charter, or the implied prohibitions of law. The credit due to the charters granted by the State, and which it is the interest of every man to maintain, cannot be strengthened and may be seriously impaired abroad by such Legislative inquiries.

As the Legislature, however, have commenced, we hope they will bring the matter to an early decision, and leave the corporation to enjoy its franchises for its own benefit and for the good, not only of our growing city, but *of the Nation*. Such is our view of the true end and influence of this Railroad, as a link in the great chain of communication between the North and South.

OHIO.

Cincinnati and Charleston Railroad.—Great rejoicings took place in Cincinnati and the adjoining town when intelligence of the final passage of the Railroad bill reached them.

KENTUCKY.

The Internal Improvement Bill, which was introduced by Mr. Guthrie, and has passed the Senate, provides for a reorganization of the Board of Internal Improvement, by which the services of disinterested and practical men will be secured, and makes the following appropriations:—

For the improvement of the Kentucky river to the Three Forks, by locks and dams.	$200,000
For the improvement of the navigation of Sandy river, and the West Fork thereof,	12,000
For the improvement of the Cumberland river from Laurel Creek to the Tennessee line,	30,000
For the construction of locks and dams in Green and Barren rivers below Bowling Green,	100,000
For the improvement of the navigation of the Three Forks, of Kentucky.	8,000
For slack water navigation on Licking river,	100,000
For the improvement of the navigation of Bayou du Chien, $1,500—for the improvement of the navigation of Panther Creek, $2,500—but one half of said money may, under the direction of the Board of Internal Improvement be applied to the improvement of two important roads, if deemed expedient,	4,000
For stock in the Lexington and Ohio Railroad Co.—to assist in constructing the line between Louisville and Frankfort,	200,000
	$554,000

In addition to this, the bill places under the direction of the Board of Internal Improvement, all monies arising from the old Bank of Kentucky, and the Bank of the Commonwealth, &c. There can be no doubt, we suppose, of the passage of the bill through the House.

We are unable to say what amount will be appropriated to Turnpike Roads, but suppose it will not fall short of four or five hundred thousand dollars.

MICHIGAN.

Detroit and St. Joseph River Railroad.—At a meeting of the Directors of the Detroit and St. Joseph River Railroad, held at the Bank of Michigan last evening, it was

Resolved, That this Board will put under contract so many miles of the Railroad, as the means furnished by the Stockholders will permit.

Resolved, That if twenty thousand dollars be added by the citizens of Ann Arbor to the sum already subscribed, it will, in the opinion of this Board, be sufficient, with the sum so subscribed, to construct the Road as far west as Ann Arbor.

Resolved, That the Chief Engineer be directed to commence the construction of the Railroad on some section as staked out between Detroit and Dearbon, forthwith.

FAR WEST.

Railroad West of the Mississippi.—The people of St. Louis, Missouri, are about projecting a Railroad from that place to Fayette, upwards of a hundred miles west of the Mississippi. The cost, it is supposed will not exceed $5000 per mile, and great advantages to the trade of St. Louis are expected to flow from the measure, if adopted.

It is thus that our Western brethren are supplying the links of that great chain of Railroad communication, which before the end of this century, will probably be unbroken between the Atlantic seaboard and the furthest limits of habitations in the West. The Atlantic and Pacific Railroad will one day be the name of that splendid whole, of which the Baltimore and Ohio Railroad is now one of the parts.

Illinois and Michigan Canal.—The following notice shows that this important work is to be commenced and prosecuted with vigor. Chicago—the city of Chicago, as it will soon be called—will soon feel its influences. We cannot at this distance see how any portion of the State can oppose such a work.

To Contractors.—Notice is hereby given to all persons who may feel disposed to take contracts on the Illinois and Michigan Canal, that the Board of Commissioners have determed to commence that work as early in the spring as circumstances will permit. The Engineers will commence

their surveys about the 10th of March, and will have several sections ready for contract by the 1st of May. It is therefore expected that definite proposals will be received from that date to the first of June. In the mean time the Board invite an early inspection of that part of the route to Chicago, and will afford any information that may be required of them.

All communications will be addressed to "The Board of Commissioners of the Illinois and Michigan Canal, at Chicago."

By order of the Board.

JOEL MANNING, Secretary.

Jan. 20, 1836.

In the following letter from the Evening Star will be found a very satisfactory account of the Boston and Lowell Railroad.

It will be perceived that in the construction of this work no expense has been spared to insure permanency and solidity.

Extract from a letter dated Boston, Feb. 20, to a gentleman in this city.

BOSTON AND LOWELL RAILROAD.

"I will now proceed to answer your several inquiries relative to the Lowell Railroad, its location, its construction, and the prospect with regard to the value of the stock, &c.

At an early period, after it began to be believed that a Railroad would afford immense facilities for travelling and transportation, the idea of constructing such a road from Boston to Lowell at once occurred to every person, who was acquainted with the localities, and had any knowledge of the business which would be carried on between the two places. In the year 1830 a favorable charter was obtained from the Legislature. The stock was taken up, and the corporation was organized. The corporation was so fortunate as to secure the services of Patrick T. Jackson, Esq., who was chosen one of the Directors and appointed sole agent for the construction of the road. Surveys were made of every possible route between Boston and Lowell, and careful plans were drawn. Particular surveys were made with reference to the point where the road should enter the city of Boston. After much examination, and a full consideration of all matters which could bear on the question, a definitive location was made, and it is admitted by all, I believe, that the best route was adopted. The agent well knew the importance of having the assistance of an engineer, who possessed not only science, but practical wisdom and experience, and such an one he employed. The agent and engineer at all times acted together with perfect harmony, devoting their time, their *whole time* and *undivided* attention to the great work. The most accurate calculations were made, the most careful inquiries were instituted in England and in this country as to the best mode of construction. Every matter was fully examined and considered in order to ascertain the exact truth. Every part of the work was consantly watched, and personally inspected. The agent resolved that a Railroad should be built in the best place, on the most solid foundation, and of the most durable materials, and I think he has accomplished his object.

The length of the road from the sea-wall in Boston to the depot on Merrimac street in Lowell, is a fraction short of twenty six miles. The line is nearly straight. There is but one curve of a less radius than three thousand feet. There are but two points where the ascent is greater than at the rate of ten feet in a mile, and the summit level or highest point above the tide water at Boston is one hundred and eighteen feet only, and that occurs at a place twenty-one miles distant from the city. A fine wide road-bed is graded on the whole line. In no place is the width less than twenty-six feet *in the clear*, and that too on a line ten inches below the top of the rail. There are comparatively few deep cuts, and in all cases the inclination or slope of the bank is at an angle of about 33 degrees only, and if it is found in any place that the earth or gravel on the slopes slides or rolls down, a further removal from the slopes is made instead of placing heavy and expensive walls at the base of the bank, as has been done with very bad calculation and economy on some Railroads, especially when these walls are placed near the Railroad track. At some few points a low wall has been built at the foot of the slope, but in all cases the same is placed at a distance of five feet at least from the track in the road. There is, therefore, all the way, room enough. There is no contraction. There is ample space for the snow to be deposited, when removed from the track, and there is sufficient room to move and work in case of accident. Large drains have been made by which the water is carried off, and as soon as the drain on the side of the second track is completed, the whole road will be thoroughly drained and kept perfectly dry. The track of the Railway now in use is laid, except for a short distance, on a trench-wall, sunk 2½ to 4 feet below the surface, according to the character of the soil, and 2½ feet thick. On these walls rest stone blocks and binders, generally six blocks and two binders to each length of rail, (being five yards,) and that rails are fastened to them.

In a recent report, made to the Directors of this road by the agent, he makes the following remarks, to wit: "it is asserted by some that wood is better than stone, even at the same cost. The reason assigned is, that wood being elastic, will yield to the pressure of the carriages passing over it, and cause the motion of them to be more easy. It will be admitted that the more level and straight the lines of Railroad are, the better it is. It must, therefore, be true, that the supports should be as solid and unyielding as possible, in that these lines may be preserved. The experience gained on the Lowell road has confirmed the agent in the opinion, that where the rails are laid on a firm foundation, with stone supports placed so near as to prevent any bending of the rail between them, so that there will be no yielding, no elasticity, there will be less jar and irregularity in the motion of the engines and cars, fewer accidents, and of course less wear and tear in the carriages and on the road, than there would be if rails were laid on a foundation and supports which, being elastic, would yield to the pressure of the weight passing over them." Much care has been taken to remove all the clay from the road, and there is very little, if any, danger of the rails being in any degree moved or affected by the frost. The rails are placed at a proper height, and it will rarely happen that the snow will fall in such quantities that it cannot be easily brushed off by the broom before the engine, or removed by the snow plough, so as not to interfere with the rail. The flanges are never in danger of striking the frozen earth, and very rarely of touching any ice near the rail. Notwithstanding the unusual severity of this winter, the cars have run with great regularity. They have been interrupted by the snow but a very few times. The whole distance is run with great uniformity in about an hour and a quarter. It has been run in an hour.

Great pains have been taken to prevent any thing, which may obstruct or annoy, from entering on, or crossing the Railroad. In all cases, where it was necessary to have any crossing from one part of a farm to another, the same has been carried over or under the Railroad; and this course has also been taken on the public highways with the exception of a very few places, and at those points gates have been erected and men are stationed to open and shut them, when the engines and cars arrive and pass. Sufficient fences are built on each side of the road throughout the whole distance, so that the entire road is made perfectly secure from all external cause of obstruction or annoyance.

The second track has been commenced, and the work will be prosecuted with all convenient despatch. On some other Railroads, as soon as a small piece was completed, the cars were set in motion, which course, though it served to amuse and astonish at a moment, yet interfered with the work, and ultimately became a source of great additional expense and trouble. But the agent of the Lowell road kept on the even tenor of his way, and when one entire track was completed the whole distance, and sufficient engines and cars to accommodate the public were obtained, he opened the road for passengers, and as soon as all things were ready and the tracks were laid at Lowell to the several factories, the transportation of merchandise was commenced.

The annual expense of the Lowell road will be less than has been anticipated. The *wear* and *tear* of the road, and of the engines and cars will be comparatively small. During the last summer, two engines passed over the road, each three times every day, and did not lose a single trip. There is hardly a limit to the number of cars, freighted with passengers or merchandise, which may be drawn with a single engine over this road. I am informed that one engine will carry from fifty to one hundred tons with ease.

There is a tract of land belonging to the corporation, containing about twelve acres,

situated on the Cambridge side of Charles river, a small part of which is used for a depot for merchandise and for buildings to accommodate cars and engines, and the residue is to be sold. There is also a tract on the Boston side, appropriated for all the wants of the corporation. To both of these tracts, vessels may come up and load and unload. A fine range of brick warehouses are now building by another corporation on each side of the Railroad track at the terminus in Boston, with suitable accommodations for lowering and hoisting goods, to and from the merchandise cars. Great facilities will be afforded for the transportation of merchandise to and from the Lowell factories.

Another advantage which this road has at present over any other, certainly in this part of the country, I will now mention. The sagacious founders of the town of Lowell, who acted under a certain corporate name, having secured all the water power created by the falls on the Merrimac river, at this place, and having purchased all the land on which the factories could be built, soon established an extensive machine shop, and took much pains to bring together a great number of skillfull artificers. Whenever they concluded to sell sufficient water power for one or more factories to a new corporation, they sold the land also on which to build the same, and contracted to erect the buildings and to furnish all the requisite machinery. At this machine shop has been built all the machinery for the several factories at Lowell, and for many other factories about the country. Here, too, all the repairs required by the machinery at any of the establishments are made.—and all this work is furnished at short notice, and according to a proper scale of prices established by the Directors, being such as shall afford a reasonable and fair profit only to the concern.

This establishment, of which Major Whistler now has the chief direction, under its wise regulations is of vast importance to all the factories at Lowell. Another department has lately been added, viz. for building locomotive engines, cars for passengers and merchandise, and for doing the on the same.

First rate locomotives have already been built here, superior, as I am assured from good authority, to any which can be imported from England. Several tenders and cars have also been built, and if any repairs are required on engines, tenders or cars, they are run directly into the shop, where each and every part of the same can be easily inspected, and all defects or injuries are detected and repaired; and all these things are accomplished at reasonable prices. The Railroad stands in the same relation to the machine shop that the factories do. The Railroad corporation has all the advantages of this excellent establishment without the risk, expense, outlay of capital, or trouble, which would attend the setting up of a machine shop for the accommodation of the Railroad only. I consider this machine shop as adding several per cent. to the value of the capital stock of this Railroad.

This stock yields at the beginning about eight per cent. per annum. The capital is fifteen hundred thousand dollars, which is fully adequate for completing the Railroad with the second track, and procuring all necessary engines, tenders, cars, fixtures, &c., and the income must certainly increase. I think it more certain than bank stock. It is owned mostly by sagacious capitalists. Those who are most familiar with the history of the road, its location, its mode of construction, its capabilities and prospects of income, have become owners of large quantities of the stock. I see no reason why the result of this enterprise should not be equal to that of the Liverpool and Manchester Railroad."

REPORT OF THE CITY DIRECTOR OF THE BALTIMORE AND SUSQUEHANNA RAILROAD COMPANY.

To the President of the First Branch
of the City Council of Baltimore:

Sir,—In compliance with an order of the First Branch in the following words, this report is respectfully submitted.

Ordered, that the Director on the part of the city in the Baltimore and Susquehanna Railroad Company report to this Branch, the relative position of that Road to the public improvement, in the State of Pennsylvania, and what advantage, if any, the position of said road occupies in relaton to the western waters, by reason of its connection with the Pennsylvania works and any other projected communication with the western waters.

From my recent connection with the Road, it will be readily perceived, the very great disadvantages I labor under in making up an opinion, even satisfactory to myself, much less such an one as will be of much utility or benefit to the Council.

In regard to the first part of your order, respecting the relative position of the Road to the Pennsylvania public improvements, I have been able, as the map accompanying will show, to furnish the information desired. I have also submitted a table from No. 1 to 8, showing the distances of the different routes contemplated, both by Railroad and Canal, from the Maryland waters to the Ohio river; also the distance from Philadelphia by the Pennsylvania routes to the Ohio river.

You will at once perceive, by casting your eye over the map the very great advantages that accrue to Baltimore by the Susquehanna Railroad, independent of those that will necessarily follow by a connection with the Pennsylvania works of Internal Improvements already completed. Although not embraced in your order, I may be permitted to call your attention to the fact, that this road is destined, ere long, to open as rich a harvest to the enterprising people of Baltimore, as that contemplated by a connection with the Pennsylvania works, for besides the improved communication which Pennsylvania has formed directly with the west, she has opened other channels along the Susquehanna Valley, which, by no very extensive prolegnation, will form for her, connections with the Erie Canal, and through it with the great northern lakes. From Williamsport, which is on the west branch of the Susquehanna, and on the line of her State improvements to Elmira or New Town, in the State of New-York, the country has been surveyed by Major Bache, United States Topographical Engineer, who, in his report made to Congress, states that a Railroad from Williamsport to Elmira, may be executed without having to contend with any very extraordinary difficulties, or those requiring expenditures beyond other works of the same description. Elmira is at the head of the Chemung Canal, through which it has a communication with Seneca lake, which is connected by a short Canal (20 miles,) with the Erie Canal. The same authority goes on to state, that it is in contemplation to connect the Internal Improvements of New-York and Pennsylvania, by uniting the Pennsylvania Canal, at Williamsport, with the Chemung Canal at Elmira. When this takes place, a choice of markets will at once be open to the products of this wide extended and fertile district of country. Baltimore will then be placed in a situation to compete with her powerful neighbors, New-York and Philadelphia, for the immense trade that must necessarily flow through this channel.

Although New-York can boast of her more ready access, all seasons of the year, to the ocean than Baltimore, yet she would have to contend with a difference of distance of one hundred and ten miles in favor of Baltimore, and should the Railroad reach the point contemplated on the Susquehanna, it will be a difference of about thirty miles in favor of Baltimore over Philadelphia. In addition to that, we afford a whole line of Railroad from Harrisburg to Baltimore, while a portion of theirs will be by Canal. What a vast field is here presented to our enterprising merchants! for it is not only the trade of the rich and fertile country bordering on the Susquehanna, she has by this road opened to her,—although that is a prize worth contending for,—when we consider the vast body of rich flats on the Susquehanna, when its various branches pass the Genesee country, and the ease with which the produce of the Genesee River can be brought to the navigable part of the Canestoe, it will appear, as a writer says, treating of the country, "that the quantity of Hemp alone which may be collected at Tioga or Painted Post, will be incalculable."

The flats on the Genesee and Canoscrago creeks alone, cannot be estimated at less than eighty miles in length, and two in breadth, forming a body of land of about eighty thousand acres, and every acre about eighteen feet deep of black mould, where one hundred bushels of corn has been raised to the acre from time immemorial.

But there is still a more valuable prize open to Baltimore by this road. Those who have not made it their business to inform themselves of the advantages of this route to the far west, can have no conception of the rich harvest that is opening to

them. Let the eye for a moment trace on the map a wide and extended country embracing whole States and territories, and those filling up with a rapidity unparralleled, composed, as the population is, too, of the hardy and enterprising yeomanry of our country; washed as this fertile country is, by the mighty inland seas, Lakes Superior Huron, Michigan and Erie. Illinois is also awakened to her best interest, by opening a communication, either by Canal or Railroad, from the head of navigation of the Illinois river to Lake Michigan, Congress having granted every alternate section of the land on the line of the contemplated improvement for that purpose. Nature, indeed, has nearly herself completed the work, for one of the head streams of the Illinois rises within ten miles of Lake Michigan, and boats of five tons burthen have already, at certain seasons of the year, passed through it to the Lake.

This river falls into the Mississippi at the town of Alton, and passes through the largest body of rich land of equal extent in the known world, and I think the prediction not extravagant that the Illinois will bear upon its bosom, one day, fully as large an amount of the valuable products of the rich valley of the Mississippi, as the noble and beautiful river that gives name to one of the States of this happy Union, the Ohio. It also opens to us a direct communication, by Railroad, and Canal, and steamboats, with New-Orleans. If Baltimore is only true to herself, a large portion of the trade of this extensive country may be made to flow into her bosom; for you will observe that the natural channel for it to take is through the lakes; and the Falls of Niagara offering insurmountable obstacles to its further progress by the lakes, it is compelled to seek the Erie Canal, and then the competition to secure it must be between New-York, Philadelphia, and Baltimore. That we may put in a claim for a large portion of it has before been fully shown, arising from the advantages of our local relations to this country, compared with those of the two other cities mentioned.

What a field is here opened to Baltimore, what a stimulent to arouse her to exertion, to know that she is placed in a situation to enable her to contend, and that successfully too, with her proud rival, New-York, for this valuable trade.

Recurring again to your orders, you will observe on the map presented, as well as the table accompanying it, that all the advantages of the main line of internal improvements in Pennsylvania, resulting to Philadelphia, must, in a great degree, operate in favor of Baltimore, so that for all the purposes of intercourse with the west, Baltimore is more favorably located than either of her rival sisters, Philadelphia and New York; and what is still better, all those advantages are comparatively of small cost to us, and such is our connection with the improvements of Pennsylvania and New-York, that it will be impossible for them to make any improvements affording greater facilities for either of their commercial emporiums to the west, without Baltimore having the full advantage of them, and that, too, without the expenditure of a single additional dollar. The Susquehanna Railroad Company have already funds in hand sufficient to complete the Road to its destined point.

Now, whether from the fact of this Road placing us on an equal footing with Philadelphia and New-York, it would not be better for us to husband up our resources, to exert all our energies in supplying our market with an assortment of merchandise equal to our two rivals in trade, and to be able to offer the same indulgence to our customers; for unless you can offer the same inducements to merchants from the west and south to make their selections of you, it will be in vain; all your attempts to secure their custom, though you offer them a road to the west through every avenue of your city, for they will only use them for travel and for the conveying of the merchandise purchased in other cities. And, indeed, who is there among us that has not witnessed with regret the large amount annually of merchandise passing through our city, belonging to men, too, who first gave us their preference, but finding the assortment incomplete, went to the north, made their purchases, and sent their goods back by your own doors to the west.

Will this course of things not continue even if you should make fifty Railroads and Canals to the west, unless you offer such advantages as to make it an object with them to stop with you? unless you do this, you may purchase their produce and New-York and Philadelphia will get the money, you may buy, and they will sell, and I think it will require no very great stretch of reasoning to show which will be the gainer or loser by such a trade. No city, I believe, could sustain itself long by buying alone. As you are furnished with a map and table of distances by the different routes to the west, I must leave it to the wisdom of the Councils to decide the value of each, either, or all the contemplated works of Internal Improvement to the Ohio river.

S. BRADY.

P. S. The Susquehanna railroad, if nothing turns up to prevent, will be open for travel to York in the course of twelve months.

Route to the Ohio River.

No. 1.

	Miles.
Baltimore to Harper's Ferry, Railroad.	80,500
Harper's Ferry to Cumberland, Railroad,	125,000
Cumberland to Youghagenny River, Railroad,	63,700
Youghagenny River to Brownsville, Railroad,	48,300
Brownsville to Wheeling, Railroad,	70,250
Total distance from Baltimore to Wheeling, Railroad,	387,750

No. 2.

Baltimore to Brownsville, Railroad, as above,	317,50
Brownsvile to Pittsburg,	50,00
Total distance from Baltimore to Pittsburg,	367,50

No. 2½.

Baltimore to Harper's Ferry, Railroad,	80,50
Harper's Ferry to Cumberland, Railroad,	125,00
Cumberland to Youghagenny River, by Railroad, with a grade across the mountains, not exceeding 50 feet to the mile,	76,70
Youghagenny River to Brownsville,	48,30
Brownsville to Wheeling,	70,25
	400,75

No. 2¾.

Baltimore to Brownsville, as above	330,50
Brownsville to Pittsburg,	50,00
	380,00

No. 3.

Baltimore to York, Railroad,	57,00
York to Columbia, do.	12,00
Columbia to Holidaysburg, Canal,	171,75
Holidaysburg to Johnstown Portage, Railroad,	36,75
Johnstown to Pittsburg,	104,00
Total distance from Baltimore to Pittsburg,	381,50

No. 4.

Baltimore to York, Railway	57,00
York to Middletown, do.	17,50
Middletown to Hollidaysbusg, Canal,	154,50
Hollidaysburg to Johnstown Portage, Railroad,	36,75
Johnstown to Pittsburg, Canal,	104,00
Total distance from Baltimore to Pittsburg,	369,75

No. 5.

Philadelphia to Columbia, Railway	81,75
Columbia to Hollidaysburg, Canal	171,75
Hollidaysburg to Johnstown, Railroad,	36,75
Johnstown to Pittsburg, Canal,	104,00
Total distance from Philadelphia to Pittsburg	394,24

No. 6.

Georgetown to Harper's Ferry, Canal,	61,06
Harper's Ferry to Cumberland, Canal,	125,00
Cumberland to Youghagenny run, Railroad,	63,80
Yonghagenny run to Brownsville, Canal,	70,25
Total distance from Georgetown to Wheeling,	68,25

No. 7.

Georgetown to Brownsville, as above,	298,00

Brownsville to Pittsburg, Railroad.	50,00
Total distance from Georgetown to Pittsburg,	348,00

No. 8.

Richmond to Covington, Canal and Railroad	212,00
Covington to Ohio River, at mouth of Kenhawa,	218,00
Total distance from Richmond to Ohio River,	430,00

In the following Report we have only selected such items of repair as occur in position worthy of note. The repairs in general are,—

Docking, to protect the banks from wash.

Removal of deposites and deepening the bed of the Canal.

Removing slides, and protecting slopes in deep cuts.

Gravelling and raising tow paths.

Substituting stone for wood in locks, &c.

ANNUAL REPORT OF THE CANAL COMMISSIONERS, TO THE LEGISLATURE OF THE STATE OF NEW-YORK.

The Canal Commissioners, pursuant to chapter nine, title nine, article second, of the first part of the Revised Statutes, respectfully submit their

ANNUAL REPORT.

The navigation on the Canals was commenced on the 15th of April, and continued, with but little interruption, until the latter part of November. The last winter was uncommonly cold, and the frost remained in the ground later in the spring than usual, making the repairs to the Canals difficult and expensive, compared with other seasons. The Canals, however, were put in a condition to accommodate the great and increasing business upon them, and so continued until they were closed by ice. The weather, in the month of November, was mild and favorable for business until after the twetieth, and the change was so sudden and unexpected as to prevent a great amount of property reaching its places of destination—to the great injury of its owners, and forwarders, and of the loss to the State of the toll upon it. Notwithstanding the early and unlooked for closing of navigation, more business has been done, and a greater amount of toll has been received on the Canal than in any former year.

The Commissioners will proceed to give a general statement of the principal repairs that have been made upon the Canal since the time included in their last annual report.

ERIE CANAL.

A new culvert has been constructed, to discharge the water from the weigh-lock at Albany into the Hudson river; of stone laid in hydraulic cement, one hundred and fifty feet in length, seven feet wide at the bottom, four and a half feet high, arched and covered with earth. The foot of the lock has been rebuilt and a culvert gate added, to facilitate the discharge of water. When the water in the river was high, it set up to this lock and prevented its use. To remedy this inconvenience, new irons to suspend the bed or cradle, on which boats rest, have been procured, made with screws to adjust the cradle at any desirable height. These irons, it is calculated, will answer for a weigh-lock after the canal is enlarged; and believed to be capable of sustaining a weight of one hundred and seventy tons.

From the head of the four locks above the Cohoes Falls, and including the first lock west of the aqueduct at the Little Falls:

During the past season the piers that support the trunk of the lower aqueduct across the Mohawk river, have been secured from the action of the frost, and the running ice in the river, by enclosing them with frames of timber, planked on the sides.—The work appears to have been done in a substantial manner, and the piers may be considered secure while the timber retains its strength.

On several of the short levels, and at other places below the locks, the force with which the water is discharged from the locks has broken the walls, and displaced the stone which had been put on the face of the bank as a protection. Timber on the top of the wall at some places, and docking at others, is found to be a good repair, and better than a wall of the ordinary description. For this purpose, 307 rods of Canal have been secured in the manner described.

On this section there have been erected 29 new bridges; several have been repaired and the covering renewed. The almost constant use of the paddle gates, renders this an expensive item in repairs, and last spring, 42 paddle gates and 10 culvert gates were put in the locks.

One breach has occurred on this section of the Canal in the last season. It interrupted the navigation about ten hours, and was repaired at an expense of about $200.

From the head of the locks at Little Falls to New-London:

Much expense was incurred in clearing out the bottom of this line of Canal, principally on that part between the head of the lock at Frankfort and the city of Utica, a distance of about nine miles. This being the east end of the long level, and no important feeder nearer than Rome, it was often depressed, when the lockages were frequent, to the great inconvenience of navigators. The removing of the deposites from the bottom, and in several places excavating below the original bottom, have in a great measure removed this inconvenience.

The decayed state of the aqueduct at Rochester, permitted a considerable quantity of water to filtrate through the joints, which had a tendency to hasten the decay of the stone in the parapet walls and arches. To obviate this, the trunk was lined with plank last spring, and it had the desired effect. The unfavorable operation of last winter and spring on the stone in the aqueduct, produced a visable change; and so threatening was the aspect of one of the arches, that it was deemed necessary to raise a bent of timber under it, to render it secure. This arch is on the west side of the water course of the river, and the bent is secure from its floods.

Measures have for some time been in a state of preparation to rebuild the aqueduct, and the work would have been put under contract last spring, had it not become necessary to suspend the proceedings, until the question of enlargement was decided. The Commissioners are aware that the failure of this important appendage to the Erie Canal, in the season of navigation, might produce distressing consequences. This event is not expected the coming season; but it is thought that a proper regard for an uninterrupted navigation would justify the expense of procuring materials for a trunk of wood, in case the aqueduct should fail. These materials are in a state of preparation, to be delivered in the spring; and if the condition of the aqueduct then should render it necessary, the timber will be framed, the plank jointed, and every thing put in such a state of readiness as to occupy but a short time in fitting it for use.—If the event for which this preparation is made should not happen, but little damage would ensue, as the timber and plank could be disposed of, or used elsewhere on the Canal.

During the last season of navigation three breaches have occurred on this section of Canal. They caused but little interruption, and were repaired for $265 21.

The line from Lockport to Pendleton has, as usual, required heavy expenditures.—During last winter 8,283 cubic yards of earth were excavated preparatory to the reception of timber and plank, as a foundation for a heavy wall to sustain the lateral pressure of the bank. For this purpose there has been used 8,316 feet of timber, and 33,264 feet of plank. Stone wall to the amount of 6,720 cubic yards has been laid on this foundation, and as a guard against the action of the frost on the wall, 1,642 cubic yards of gravel was placed behind it.

This part of the canal is reported to be in a better condition than it has been for several years past, though the superintendent entertains some fears that the water and spring may have an unfavorable influence on the navigation of next season, and the expense of repairs next spring.

The contracted channel of the Canal from Lockport to Penoleton, has for several years been insufficient to pass conveniently the quantity of water necessary to supply the Canal to the Seneca river. In order to force through this channel the desired quantity of water, the dam at the mouth of the Tonewanta creek has been maintained through the season of navigation six feet above the bottom of the Canal. This has an injurious effect on the low lands adjoining the stream.

The contemplated enlargement of the Canal should be commenced at this place, at an early period, in order that an adequate quantity of water may be sent forward from Lake Erie, the country redeemed from evils which have been mentioned, and the annual expenses for repairs diminished.

Repairs, other than those mentioned in

this report, have been made upon this Canal, which, in the aggregate, amount to a large sum; but if stated singly, would appear of too trifling a character to find a place in an annual report. Great expense was incurred the last winter and spring, in removing obstructions from the bottom and sides of the Canal; and it is believed that a better and less interrupted navigation was mantained the last than any previous season.

Pursuant to the act in relation to the Erie Canal, passed May 11, 1835, the Commissioners submit the following Report:

After the passage of this act, all proceedings under the act to provide for the improvement of the Canals of this State, passed May 6th, 1834, were suspended, except the payment of damages that had been appraised, and the construction of waste-weirs and races to carry water around locks.

A meeting of the Canal Board to take into consideration the act entitled "An act in relation to the Erie Canal," was held at the Comptroller's office, Canal Room, on the 30th June last, and on the 3rd day of July, it was resolved by that Board, that the Canal Commissioners proceed without delay, to cause surveys and estimates to be made of all the improvements contemplated by said act. Pursuant to said resolution, surveys and estimates were made of the entire line of the Erie Canal, which were submitted to the Canal Board, at an adjourned meeting held for that purpose, on the 20th day of October; at this meeting, the question as to the dimensions to which the Canal and locks should be enlarged, was passed upon; some further surveys ordered, and an adjourned meeting was directed to be held on the 23d day of November. After this last meeting, it was too late in the season to commence the surveys with reference to location for locks. The proceedings of the Canal Board will be detailed in a report to be made by that Board, accompanied by the report and estimates of the engineers appointed to make the surveys.

The plan of a new aqueduct at Rochester was so intimately connected with the question of enlargement that its re construction was unavoidably suspended until the necessary surveys were made, and the question of enlargement decided. The importance of this work, and its decayed state, rendered it proper that there should be no unnecessary delay. A new location for the aqueduct has been decided upon by the Canal Board, and sealed proposals have been received for its construction, and also for culverts and excavation in the bed of the river, and excavation and embankments at each end of the aqueduct. No contract has yet been entered into for the construction of the aqueduct: the other work is under contract, and it is expected that a contract will soon be entered into with some of the persons proposing for the construction of the aqueduct.

The reasons for changing the location of the aqueduct will be detailed in the report of the Canal Board, and the report of the engineers before referred to.

The Commissioners intend that the surveys shall be commenced as early in the spring as the weather will permit; and as fast as the location of the locks can be made, to put them under contract. This proceeding will be extended from Albany to Syracuse.

The two first locks west of Palmyra, two of the three locks at Lockville, and one at Lyons, are in such a dilapidated condition as to render a reliance upon their use for any considerable length of time, very uncertain; and there can be no doubt as to the propriety of substituting new ones. It is intended to put these under contract as early next season as the necessary examinations can be completed, to be finished in the fall of 1837 or 38, as the appearance of the old locks next spring shall seem to render necessary.

The new locks on the line will be made on locations suitable for the enlarged Canal, and constructed on the plan of the enlarged locks. This rule will be adopted in reference to all new structures, as far forth as its application will be deemed beneficial to the State.

With a view to the improvement of the Erie Canal, the Commissioners have divided the line into four sections; to each of which they have assigned a chief engineer. Section No. 1 commences at the city of Albany and extends to the east end of the Rome summit, and is assigned to John B. Jervis: section No. 2 extends from the latter place to the west bounds of the village of Jordan, and is assigned to Holmes Hutchinson: section No. 3 extends from the latter place to, and includes the feeder from the Genesee river, and is assigned to Frederick C. Mills: and section No. 4 extends from the latter place to the termination of the Canal at Buffalo, and is assigned to Nathan S. Roberts.

The re-surveys, as has been before stated, will commence on all these sections early next spring, with the view of designating the exterior bounds of the Canal at as early a period as may be consistent and practicable. It is probable that in all the cities and villages the line may be permanently located in all the next season. This is deemed important in reference to improvements which are constantly making at these places, and a special direction will be given to the surveys in reference to this object.

So far as the surveys made last season have developed the practicability of enlarging the Canal and executing a permanent work, without materially interrupting the navigation, nothing has appeared insurmountable, or more difficult than a cursory examination of the subject had indicated.—It is, however, a difficult, and in some respects, a fearful undertaking. The interference with private property, the immense expenditure, and the circumstances under which the work must be executed, will impose greater responsibilities, and require more mental and bodily exertions, than in the construction of an entire new work.—Experience has so far simplified and systematised the course of proceedings in the construction of new Canals, as to render the duty comparatively easy.

To plan and arrange the execution of the work appertaining to the enlargement of the Canal and a new set of lift locks, so that the part which may be done during the season of navigation, and those which must be done in the winter, can be clearly delineated in order that a basis may be furnished for a specific contract, will be no easy matter.

The economy of executing a public work depends very much on the manner in which the necessary arrangements are matured, previous to the execution of the contracts, in order that all work may be put to specific prices.

Great pains should be taken to perfect all the plans and locations; to point out the different kinds of work, and the circumstances under which it must be done; to enable the person offering for contracts to propose specific and intelligent prices, and to secure the navigation of the Canal from the chance of interruption. Under such circumstances the person proposing is enabled to fix proper prices, and can have no reasonable excuse, if from competition or any other cause, he is induced to enter into contracts for an inadequate compensation. This often occurs, and is the source of unpleasant embarrassments in the execution of a public work, as well in regard to its faithful performance as its progress. If the plans and locations are not well matured, it necessarily leads to alterations during the progress of the work, and generally imposes on the contractor extra expenses, for which he should be fairly and fully indemnified.—For these expenses the contractor has no prices, and generally no provision in his contract that indicates the rate of compensation. This state of things often excites the cupidity of a contractor, from an inordinate desire for gain, or to cover losses under a bad contract, to claim an allowance unjust and improper. Work, of the description which has been mentioned, is often done under circumstances which renders it difficult to ascertain the expense; and to liquidate accounts of this kind is always very embarrassing. It is, however, proper to remark, that notwithstanding all practical circumspection is exercised, the necessity of altering plans and changing locations sometimes occurs, for causes which cannot be foreseen.

There have been instances where contractors have failed in paying laborers in their employ. A great portion of the laborers on our public works are foreigners, who are not aware of the protection afforded them by the laws of our country. They are generally poor and destitute, relying on their wages for their daily subsistence of themselves and families. The laborer in all situations, is "worthy of his hire," and to withhold it under such circumstances, is exceedingly cruel and unjust.

In undertaking the extensive improvements on the Erie Canal, it may be deemed expedient to incorporate a provision in the contracts, giving the Commissioners some control over the matter.

The failure of contractors to pay their men, aside from its gross injustice, has a very unfavorable effect on the progress of the work, and enhances its cost. It affects the character of the work, and the interest of all the contractors. These laborers cannot readily ascertain the character and solvency of the contractors, and if one contractor fails in paying his men, it creates

a fear and suspicion, which affects all.—The information passes from one friend to another, it spreads beyond the borders of the State, exerts a great influence in preventing laborers from coming to a public work, where they are not honestly paid.

The prohibition of sub-contracting will do much to remedy this evil.

CHAMPLAIN CANAL.

Last summer the Saratoga dam was bracketed before the usual time for low water. The brackets were of plank, 17 inches high: the pond readily filled, and the water in it was at all times during the season of navigation, above top water line in the Canal below the guard lock; but boats were frequently aground on the bottom of the Canal below Johnson's bridge. This was occasioned in part by bars formed in the Canal at narrow places, by the irregular supply of water that could be passed through the lock to feed the Canal when the lockages were frequent, and by some parts of the Canal in rock cutting, below the guard-lock not having been excavated to bottom. To remedy this inconvenience, it is intended during the winter, to remove the bars, excavate the bottom and sides of the Canal in the narrow and shallow places, and construct a water-way to pass water round the rock to feed the levels below it.

The discharge lock at Saratoga is founded on quick-sand. The water passed under and along the sides of it twice last summer. A part of the embankment was taken out and replaced with better materials; but there have since been leaks discovered, and it is believed that the safety of the work requires that a thorough repair should be made before the opening of navigation.

In a time of low water in the Hudson river last summer, the water in the pond above the Fort-Miller dam, was lower than the top water line in the Canal. A set of reverse gates were constructed in the feeder south of the guard-lock, to retain the water in the Canal to its proper elevation. Unless the dam is raised, it will be necessary to construct another set of gates, to use the feeder for navigation at times of low water in the river.

The sliding bank at Hinman's Point requires protection. The bank is principally of clay, resting on slate rock, inclining towards the river, which washes the embankment. Piles cannot be driven to afford any security on account of the rock. It will therefore be necessary to place a pier of wood at the foot of the embankment, firmly resting upon and securely bolted to the rock and filled with stone.

Piles have been driven to secure the towing-path from sliding south of Stuart's. It will be necessary to extend this work next season. A new trunk is required for the Fort-Edward acqueduct.

An additional paddle-gate, three feet square, has been put in the Fort-Edward lock, to facilitate the lockages; and a slide-gate has been put in the sluice by the side of the lock, to pass water from the feeder to the level below it. The walls of this lock have moved inwards, and at some points are but thirteen feet two inches apart. From this and the imperfect state of the masonry generally, it has become necessary to re-build it before the commencement of navigation.

The waste-weir at Smith's basin and the one near Holmes' on the summit level of this Canal, have been re-built of permanent stone masonry. The bridges over them are formed of large flat stone, covered with gravel, resting on stone abutments and piers, from three to four feet apart; slide and roll-gates are inserted in a frame work constructed immediately below the piers, connected with, and well secured in the abutments, at the ends, and supported at the centre by a stone buttress. The water wastes over the frame and preserves the timber from decay. That at Smith's basin is now in use. At the other place the old waste-weir is to be taken out, the space filled with earth, the towing-path straightened, some embankment to be removed from the front of the new weir, and docking put in at the ends of it.

The repairs contemplated in the last annual report of the Commissioners, to the locks at Whitehall, were not made last spring on account of unfavorable weather for work of that kind. The materials are on hand, and if the weather is favorable, the work will be done next spring.

Breaches have frequently occurred in the embankment, and dry wall constructed for the protection of the canal above these locks. The expense of repairing breaches, the contracted width of the Canal at this place, and the importance of maintaining an uninterrupted navigation, require that a substantial plan of improvement should be adopted.—The public works at this point are limited on one side by Wood creek, and by one of the streets of the village on the other. The utmost extent of ground that can be occupied for the canal, without encroaching upon the channel necessary for the creek, or taking a part of the street, is too circumscribed to admit of making an embankment of earth for the whole distance. It will therefore, be necessary to continue a wall of cemented stone masonry, from the present wall at the head of the locks, about 210 feet, and make an embankment of earth, protected on the outside by a slope wall about 700 feet in length. If this was done, a waste-weir necessary to regulate the water on this level, might be built in the wall above the locks, to discharge water into the bed of the creek.

At the head of the Glen's Falls feeder, a guard lock of hammered stone has been built on the north side of the old lock of wood, that had become unfit for use. About 350 yards of earth and 400 of rock are to be excavated, to complete the entrance at the head and foot of the lock. This work is in progress and will shortly be finished.

A breach occurred in this feeder on the 26th of July last, in the high embankment above the village of Glen's Falls. It was repaired at the expense of about three hundred and fifty dollars.

The locks on the feeder are of wood; there are thirteen, numbered from 8 to 20 inclusive. Seven have received repairs the past season.

The navigation on the feeder is greatly delayed for want of sluices, or water-ways to pass water round the locks to feed the canal. The water has to be passed through the locks, and cannot be drawn in sufficient quantities, when they are much used for passing floats. Much inconvenience has resulted from the contracted width of the feeder at several places, particularly at the village of Glen's Falls, where the largest amount of tonnage, transported in boats, is loaded and unloaded. About 1,600 floats have passed through these locks the last season.

The Commissioners in their last annual report, at page 22, stated that an examination of the Glen's Falls feeder had been made by Holmes Hutchinson, Esq. His report will be found appended to their report and marked D. The Legislature is respectfully referred to these reports. They were made under the expectation that legislative direction would be given in relation to this feeder. After the adjournment of the Legislature, without acting upon this subject the Commissioner having charge of this line of Canal did not think he was authorized to make the improvements recommend in the report of Mr. Hutchinson, in the course of ordinary repairs. He submitted the question to the Canal Board, and they advised him by resolution, to suspend the rebuilding of the lift locks on the Glen's-Falls feeder, until the Canal Commissioners have an opportunity to submit the question as to rebuilding said locks. to the Legislature.—The Commissioners are of opinion that they do not possess the power to make the improvement recommended in the report of Mr. Hutchinson, under the authority given them to make ordinary repairs, for the reason that it would be necessary to make an additional appropriation of land; and that the Canal Board have not the authority to direct them to be made as extraordinary repairs, because the estimated expense exceeds thirty thousand dollars.

In the month of December last, Frederick C. Mills, civil engineer, was requested by the acting Commissioner to examine the Champlain Canal, Fort Edward dam, and Glen's-Falls feeder. He has made the examinations required, and reported the result. In his report in relation to the Glen's-Falls feeder, he says, "If the plan for improving this work, suggested in the report of Holmes Hutchinson, civil engineer, be adopted, which, from the cursory examination I have been permitted to make, I would recommend, or in case the feeder is barely maintained for the purposes of navigation, it is believed to be the superior economy to reconstruct the present locks, as they decay, of hammered stone masonry, laid in hydraulic cement."

The business upon this feeder is said to be increasing; and it is deemed important to a large section of country, that it should be continued in a navigable condition. To do this, it is necessary that the work of rebuilding locks, should be commenced within a short time.

The Commissioners are of opinion that the feeder should be improved upon the plan generally, as recommended in the report of Mr. Hutchinson, perhaps varying in some of the details: but they submit the question to the Legislature, and respectfully ask their direction as to the manner of its repair or improvement.

To be Continued.

From the rapid increase in business on the New-York and Ohio Canals, it is to be presumed that when the Sandy and Beaver Canals shall have been finished, the tolls on the Ohio Canal will at least amount to $400,000 per annum; and from the foregoing facts and statements it is to be inferred, that two thirds of that trade will pass through the Sandy and Beaver Canal, which would neat the holders of stock in that work, at the rate charged on the Ohio Canal, an income of at least $60,000 the first season.* If to this sum is added the amount that may be anticipated from the liberal grant contained in the amended charter,† which cannot fall short of $150,000, the Company will receive, in the first year after the work is finished, $210,000 in tolls—independent from the large business that may be expected of the country west and northwest of the termination of their work—presenting the novel result of a Canal yielding seventeen per cent. on its entire cost the first year after its completion.

All which is respectfully submitted.

E. H. Gill, Chief Engineer
S. and B. Canal Co.

New-Lisbon, Ohio, Nov. 11, 1835.

From the Mechanics' Magazine.

STRENGTH OF THE JOURNALS OF SHAFTS.

Lateral strength.

Mr. Roberson Buchanan, in his Essay on the strength of shafts, uses the following rule, which is simple enough, and easy to be remembered: "The cube root of the weight in cwts. is nearly equal to the diameter of the journal." "*Nearly equal*"—being prudent to make the journal little more than less, and to make a due allowance for wearing.

Examples.—What is the diameter of the journal of a water-wheel shaft, 13 feet long, the weight of the wheel being 15 tons?—$\sqrt[3]{15\times 20}=6{\cdot}7$ or 7 inches.

But the following rules are the most correct, and ought to be used on all occasions:

When the weight is in the middle.

1. Rule.—Multiply the weight in pounds by the length in feet; divide this product by 500, and the cube root of the quotient will be the diameter in inches.

When the weight is between the middle and end.

2. Rule.—Multiply the short end by the long end; then multiply that product by four times the weight in lbs. Divide this product by 500 times the length in feet, and the cube root of the quotient will be the diameter in inches.

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* This estimate may seem large, but it must be kept in mind that the Sandy and Beaver Canal will constitute a connecting link between two large and important works, (the Ohio Canal and Pennsylvania improvements) now completed; consequently it has not, like other Canals, to await the growth of business.

† The amended charter secures to the Sandy and Beaver Canal Company all the tolls collected on the Ohio Canal from boats that have passed through the Sandy and Beaver canal for seven years after its completion.

When the load is uniformly distributed over the length.

3. Rule.—Multiply the length in feet by the weight in lbs., and one tenth of the cube root of the product will be the diameter in inches.

When fixed at one end, and the load applied at the other.

4. Rule.—Multiply the length of projections in feet by the weight in lbs., and the fifth part of the cube root of this product will be the diameter in inches.*

Examples.—By rule 1—

$\frac{33600\times 13}{500}=873\sqrt[3]{873}=9\frac{1}{2}$ in. dia.

By rule 3—

$33600\times 13=436800\sqrt[3]{\frac{436800}{10}}=7{\cdot}65$ in.

To resist tension or twisting.

It is obvious that the strength of revolving shafts are directly as the cubes of their diameter and revolutions; and inversely as the resistance they have to overcome.

Mr. Buchanan, in his Essay on the strength of shafts, gives the following data, deduced from several experiments, viz: That the fly-wheel shaft of a 50 horse power engine, at 50 revolutions per minute, requires to be $7\frac{1}{2}$ inches diameter; and therefore the cube of this diameter, which is = 421·875, serves as a multiplier to all other shafts in the same proportion; and taking this as a standard, it gives the following multipliers, viz:

For the shaft of a steam engine, water wheel, or any shaft connected with a first power, - - - - - - 400

For shafts in insides of mills, to drive smaller machinery, or connected with the shafts above, - - - - - 200

For the small shafts of a mill or machinery, - - - - - - - 100

From the foregoing, the following rule is derived, viz:

The number of horses' power a shaft is equal to, is directly as the cube of the diameter and number of revolutions; and inversely, as the above multipliers.

Note.—Shafts here are understood as the journals of shafts—the bodies of shafts being generally made square.

Example 1.—When the fly-wheel shaft of a 45 horse power steam engine makes 90 revolutions per minute, what is the diameter of the journal?

$\frac{45\times 400}{90}=200\sqrt[3]{200}=5\frac{8}{10}$ inches diameter.

Example 2.—The velocity of a shaft is 80 revolutions per minute, and its diameter is three inches. What is its power?

$\frac{3^3\times 80}{400}=5{\cdot}4$ horse power.

Example 3.—What will be the diameter of the shaft in the first example, when used as a shaft of the second multiplier?*

$\frac{5{\cdot}8}{1{\cdot}25}=4{\cdot}64$, or $\sqrt[3]{\frac{45\times 200}{90}}=4\frac{6}{10}$ in. diameter.

The following is a table of the diameters of shafts, being the first movers, or having 400 for their multipliers, upon the foregoing principles.

TABLE.

DIAMETETS OF THE JOURNALS OF FIRST MOVERS.

Horses power.	REVOLUTIONS.									
	10	15	20	25	30	35	40	45	50	55
4	5.5	4.8	4.5	4.	3.7	3.8	3.5	3.3	3.2	3.1
5	5.9	5.1	4.7	4.4	4.1	3.9	3.7	3.6	3.5	3.3
6	6.3	5.5	5.	4.6	4.4	4.1	4.	3.8	3.7	3.6
7	6.6	5.8	5.2	4.9	4.6	4.4	4.2	4.	3.9	3.7
8	6.9	6.	5.5	5.1	4.8	4.6	4.4	4.2	4.1	4.
9	7.2	6.3	5.7	5.5	5.	4.8	4.5	4.4	4.2	4.1
10	7.4	6.6	5.9	5.6	5.2	4.9	4.7	4.6	4.4	4.2
12	7.9	6.9	6.3	5.8	5.6	5.4	5.2	5.	4.8	4.6
14	8.3	7.2	6.7	6.2	5.9	5.6	5.4	5.2	5.	4.7
16	8.7	7.6	7.1	6.6	6.1	5.8	5.6	5.4	5.2	5.
18	9.	7.9	7.5	7.	6.6	6.2	5.8	5.6	5.4	5.2
20	9.3	8.1	7.4	7.2	6.6	6.4	5.9	5.7	5.6	5.4
25	10.	8.5	8.	7.4	7.1	6.8	6.3	6.	5.9	5.6
30	10.7	9.3	8.4	7.9	7.4	7.1	6.9	6.7	6.5	6.3
35	11.4	9.8	8.9	8.4	7.9	7.4	7.1	6.9	6.6	6.5
40	11.7	10.5	9.3	8.8	8.3	7.8	7.4	7.2	6.9	6.7
45	12.	10.6	9.7	9.2	8.7	8.1	7.6	7.4	7.	6.8
50	12.6	11.	10.	9.3	9.	8.5	8.	7.8	7.4	7.3
55	13.4	11.4	10.4	9.8	9.1	8.8	8.4	8.	7.5	7.4
60	13.6	12.	10.8	10.	9.3	9.	8.6	8.2	7.7	7.6

INCHES DIAMETER.

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* This last does not directly apply to shafts—but it may be useful for other purposes.

* The diameters of the second movers will be found by dividing the numbers in the table by 1·25, and the diameters of the third movers by dividing the numbers by 1·56.

S. A.

July 25, 1835.

The following communication was in hand before the conflagration, and should have appeared in the January number, but from the confusion into which every thing preserved was thrown, gave it the go by. We will now give it a place, and commence it with the P.S., that we (understanding fully the importance of the *first person*,) and our readers may have the benefit of its reasoning.

We bespeak for it an attentive perusal, and shall be gratified to be made the medium of communication for answers to the following queries, as well as of queries from D. F. and others, in relation to any subject proper for this Magazine.

QUERIES RESPECTING VERTICAL AND HORIZONTAL WHEELS, AND HEATING LARGE BUILDINGS.

P. S.—If you are in want of a caption for the following communication,—as you editors are fond of a title that will attract attention to an article,—you may head it with "*The advantages of the Mechanics' Magazine and New-York Farmer.*" The propriety of which, in a three-fold view, may be thus inferred: If any one is induced by the suggestions herein made, to subscribe to your journals, in the hope of benefitting himself in this way, he will probably find his advantage in it; if he pays his subscription as he should, your advantage will be apparent; if any of your readers answer my questions

to my satisfaction, I shall certainly derive advantage from it. By this, I flatter myself, you will perceive that, although I *have* evinced some ignorance in this, I have been to school long enough to learn the proper grammatical relations of "I, Thou, He;" and albeit, in this enumeration of advantages I have committed the blunder of placing the "first person" last, the transposition is unimportant, as I am satisfied that you will not suspect me of such ignorance as not to know that most importance is to be attached to it.

4th Dec., 1835.

Mr. Minor,—Among the many advantages to be derived by artists and scientific men from such valuable journals as yours, is one, of which they avail themselves so little, that they appear not fully to appreciate it. I allude to the facility they afford of obtaining information on any subject, by questions proposed to the readers of them. In this way they might be made a good substitute for the *converzationes* so common throughout Europe, and which are the means of diffusing the lights of science so extensively; with this advantage: that a question inserted in them, instead of being put to a select few, would be propounded to all the learned in art or science throughout our widely spread territory.

It is frequently the case that a person is so situated that he may not know where to look for information upon a particular subject, although it may be abundant, or easily accessible to those whose business or reading may have lain in that path.—Such are frequently deterred from seeking information in this manner from the fear of exposing their ignorance; not reflecting that the most knowing were once as ignorant as themselves, and are indebted chiefly to others for their present superiority. Partly with the view of setting an example in this respect, and partly for the purpose of obtaining information that I cannot readily find elsewhere, I shall propose a few questions for insertion in your Mechanics' Magazine and Farmer, giving your readers leave to credit me for as great ignorance as they please, if they will but answer my questions; for which I promise them my thanks, and a willingness to help them out of similar difficulties, if it should lie in my way.

Questions.—Can a stream of water be used to as much advantage, or made to do as much work, upon a vertical or tub-wheel as upon a horizontal one; and if so, what is the best construction for one, and the cost of building it? Will the same quantity of water that is let, in a thin sheet, upon a horizontal wheel, produce the same effect if let in solid column upon a vertical wheel under the same head and fall?

What is the best and most economical mode of heating large buildings—by introducing heated air from a furnace—by pipes, heated by steam, carried around the different rooms, or by similar pipes, filled with boiling water? What is the size necessary for a furnace to heat a room or a house of any given dimensions—what should be the size of the flue for heating the whole house—what that for heating a particular room—what the best construction for the furnace,—and what quantity of fuel (wood or coal,) will be consumed per hour (if the fire be kept up day and night,) upon the hot air plan—and what the cost? What are the respective properties of furnace, boiler, pipes, &c., upon the other plans—the best construction and cost? Are pipes of hot water, which are used to such advantage in warming houses in England, sufficient for the purpose in a country where the winters are so intensely cold as ours sometimes are?

Yours, D*** F*****.

COMPOSITION AND SPECIFIC GRAVITY OF DIFFERENT KINDS OF GLASS.

Ordinary flint-glass, according to Mr. Faraday's analysis, consists, in 100 parts, of silica 51.93, oxide of lead 33.28, potash 13.77, with minute portions of other substances. A specimen of the same kind of glass, manufactured for telescopes by the late M. Guinand, yielded the same chemist, silica 44.3, oxide of lead 43.05, and potash 11.75. Mr. Faraday found the specific gravity of M. Guinand's glass to be about 3.616, that of ordinary flint-glass 3.290, that of plate-glass 2.5257, and that of crown glass 2.5448.

Glass has usually been considered, without much actual inquiry into the subject, to be strictly a chemical combination of its ingredients, and in all respects a very perfect artificial compound. This, however, is far from being the truth, as will appear from the following facts. That the alkali in common glass of all kinds is in a very imperfect state of combination, many circumstances concur to evince. For example, Mr. Griffiths has shown, that if a small quantity either of flint-glass, or of plate-glass, be very finely pulverized in an agate mortar, then placed upon a piece of turmeric paper and moistened with a drop of pure water, strong indications of free alkali will be obtained; and that if the pulverization be very perfect, the alkali can be detected in other kinds of glass, containing far smaller quantities of it. This proves, that in whatever state of combination the alkali may be, it is still subject to the action of moisture. That flint-glass is by no means a compound resulting from very strong chemical affinities, and that the oxide of lead which it contains is as imperfectly combined as the alkali, has been shown experimentally by Mr. Faraday, and also appears from the tarnish which is produced on its surface by exposure to sulphuretted vapors, owing to the combination of sulphur with the lead. Glass which has long been exposed to the weather, frequently exhibits a beautiful iridescent appearance, and is so far decayed, that it may be scratched with the nail. The glass of some bottles of wine which had lain in a wet cellar near the Bank of London upwards of 150 years, examined by Mr. Brande, was soft, and greatly corroded upon the surface, in consequence of the partial abstraction of its alkali. After reciting some of these facts, and others of a similar description, Mr. Faraday observes, "Glass may be considered rather as a solution of different substances, one in another, than as a strong chemical compound; and it owes its power of resisting [chemical] agents generally, to its perfectly compact state, and the existence of an insoluble and unchangeable film of silica, or highly silicated matter, upon its surface." See Mr. Faraday's Bakerian Lecture on the manufacture of glass for optical purposes; Phil. Trans. 1830, pp. 46—50.—[Parke's Chem. Cat., by Brayley. (Arcana, &c., 1835.)

RUTTER'S HEAT PROCESS.

Dr. Daubeny brought before the meeting the economical employment of coal-tar in connexion with water as fuel, according to the method lately suggested by Mr. Rutter.* A discussion then arose as to whether the water in this case acts chemically or mechanically, or both, in facilitating the combustion of the tar. Mr. Macintosh stated that by repeated experiments he had found that coal-tar gave no more heat when burned than an equal weight of *splint* coal, the kind preferred, where a long continued heat is required. Mr. Low also stated, that from long experience he could affirm, that the use of water along with coal-tar was productive of no benefit whatever, and that 3 gallons, or 33 lbs. of coal-tar, give an equal amount of heating effect, fully, to 40 lbs. of coke, made from the Newcastle coal of the Hutton seam. From the discussion on this subject, which was protracted for some time, it appears to be established—1. That tar may be used as fuel, but that it does not give much more heat than the same weight of the best coal. 2. That when mixed with water, it flows more easily through tubes, but does not appear to evolve more heat than when used alone.—[Jameson's Journal.]

* Originally suggested by Capt. Morey, of New-Hampshire.

From the London Mechanics' Magazine.

VENTILATION OF STAGE-COACHES.

Sir,—Permit me to offer to the public, through the medium of your widely extended Magazine, a hint or two from an old traveller, on the subject of stage-coach ventilation. Many others as well as myself have doubtless been annoyed by the *aerophobia* of many who travel by our public carriages, and the pertinacity of such persons in keeping the windows closed, for fear, as they say, of catching cold. Such persons have yet to learn that colds are more frequently the consequence of closely confined air in a badly ventilated apartment, than by free exposure to the wind and weather. Some people seem to regard fresh air as poison, and do all in their power to exclude it; for my own part, I think it is the only one of the numerous blessings of Providence that cannot be taken to excess.

The mode of ventilation I would suggest, is simply this, that the sashes of mails and other stage-coaches, instead of being glazed, as at present—the panel formed by a pane of glass—should be made with wire-gauze, such as is now extensively in use for window-blinds. The vehicle would by this means be amply ventilated without annoyance to any one by currents of air; and, in case of rain, the sashes might be kept up without the choice of evils at present experienced, either to be wet through or suffocated.

An Old Traveller.

AGRICULTURE, &c.

From the Farmers' Register.

ON THE USE OF LIME AS MANURE.

By M. Puvis.

Translated for the Farmers' Register from the Annales de l'Agriculture Francaise, of 1835.

Various qualities of Lime.

22. It is necessary for the farmer to know the nature of the lime which he uses. It may be pure, or mixed with silex, argil, or magnesia. *Pure lime* is the most economical, the most active, that which can produce the most effect in the least quantity.

Silicious limestone is used in greater quantity. The lime from it receives, as does the foregoing, the name of *hot lime*, and there is little difference in the application, except that more of the latter is wanting.

The *argillaceous lime* is the same as the hydraulic lime, or the *poor lime* of builders. It appears that the first two kinds are more favorable to forming grain, while the latter favors more the growth of straw, grasses, and leguminous crops. It is better for the improvement of the soil, but a heavier dose of it is required.

Magnesian lime acts very powerfully, but exhausts the soil if given in a large dose, or if it is not followed by alimentary manure in abundance. It has exhausted some districts in England, and entire provinces of America,* and it is to this kind that seem due most of the complaints made against lime.

By chemical processes the farmer may make himself sure of the nature of the lime which he uses.

Pure lime is commonly white, and is dissolved without any thing being left, in nitric or muriatic acid.

Silicious lime is often gray, and leaves a sandy residue, [after solution,] which is rough to the touch.

Argillaceous lime is obtained from stones which have a clayey odor and appearance: it is commonly yellow—and leaves, after the solution, a residue which is mostly an impalpable powder [*et qui prend en masse,*] which may be formed into a mass when wet.

Magnesian lime is made from stone commonly colored brown or pale yellow; it forms a white cloud in nitric acid, diluted with water, and used in less quantity than enough for saturation.

Of second Limings.

23. When the limed field returns to the state in which it was before the operation, when the same weeds re-appear, and the crops lower in product, it is time to renew the application of lime. It may be conceived that the time of the second liming depends on the amount given in the first. When the dressing has been light, it is necessary, as is done by the Flemings and the Manceaux, to recommence entirely, or to the extent of the first dressing: when it has been heavy, the next may be diminished by one-half. Besides, in this matter we should take counsel of the state of the soil, and of experience, because there are some lands which demand, and can use heavier doses of lime than others.

Quantities applied.

24. The quantities of first as of second dressings of lime, vary with the consistence of soils: they ought to be small on light and sandy soils—and may, without ill consequences, be heavy on clay soils.

The dose ought to vary according as the soil is more or less pervious to water, or as drained well or ill by its texture. Small applications to soils from which the superfluous water does not pass easily, are but little felt; but if the dressing is heavy, and the ploughing deep, the lime aids the draining, and adds to the healthy state of the soil. It may be conceived that the quantity of lime ought also to be increased with the annual quantity of rain that falls—because in proportion to that quantity ought the openness of the soil, and its fitness for draining, to be extended.

Nevertheless, the practices of the departments of the North, and of La Sarthe, seem to indicate the average dressing which suits in general for land: thus the liming of the North, which every ten or twelve years gives to the soil 40 hectolitres of lime to the hectare, or a little more than three hectolitres a year, agrees with that of La Sarthe, which gives eight or ten hectolitres every three years. The first plan gives at one dressing what the other distributes in four: as both make a like average, it may be thence inferred that the earth demands annually three hectolitres of lime to the hectare, [3 2 3 bushels to the acre,] to sustain its fecundity. But as neither the soil nor the plants consume all this quantity of lime, it is to be believed, that at the end of a greater or less length of time, the soil will have received enough to have no more need of it for a certain space of time.

Manner of treating Limed Lands.

25. After having, by liming, given the soil a great productive power, having put it in condition to produce the most valuable crops, which are often also the most exhausting, it is necessary to husband these resources—to give manure in return for the products obtained—to employ as litter, and not as food, the straw, now increased by one-half—to raise grass crops from the soil now fitted to bear them with advantage—in short, to modify the general plan, and the detail of the culture according to the new powers of the soil, the prices of commodities, and to local conveniences.

However, it is not necessary to hurry the change of the rotation. Such an operation is long, difficult, very expensive, and ought not to be executed but with much deliberation.

Effects of Lime on the Soil.

26. The effects of lime, although similar to, are not identical with those produced by marl; and the qualities of soils limed, differ in some points from those of natural calcareous soils. The grain from limed land is rounder, firmer, gives less bran, and more flour, than that from marled land: the grain of marled land is more gray, gives more bran, and resembles that made upon clover, though it may be preferable to the latter. The grain of a limed soil is more like that from land improved with drawn ashes. Limed land is less exposed to danger from drought than marled land, on soils naturally calcareous. The crop is not subject to be lodged at flowering time, when the sowing was done in dry earth.

27. In limed earth, weeds and insects disappear. The earth, if too light, acquires stiffness, and is lightened if too clayey. The surface of the argilo-silicious soil, before close and whitish, is made friable, and becomes reddish, as if rotten: it hardens and splits with drought, and is dissolved by the rains which succeed. This spontaneous loosening of the soil facilitates greatly the labor of the cultivator, the movement of the roots of the growing plants, and the reciprocal action of the atmosphere upon the soil, which remains open to its influence.

All these new properties which the limed soil has acquired, doubtless explain in part the fertilizing means which calcareous agents bring to the soil: but we think it is still necessary to seek some of these causes elsewhere.

28. Lime, according to the recent discoveries of German chemists, seizes in the soil the soluble humus or humic acid, takes it from all other bases, and forms a compound but slightly soluble, which appears, under this form, eminently suitable to the wants of plants. But as this compound is not soluble in less than 2000 times its weight of water, while without the lime the humus is soluble in a volume of water, less by one-half, it would follow that, in consequence of lime, the consumption of this substance, and the productive power of the soil would, in like proportion, be better preserved. Since the products of the soil increase much from the liming, while the humus is economised, since these products borrow very little from the soil, which remains more fertile while thus yielding greater products, it follows that the principal action of the lime consists, at first, in augmenting, in the soil, and in the plants, the means of drawing from the atmosphere the vegetable principles which they find there, and next, in aiding, according to the need, the formation, in the soil or the plants, the substances which enter into the composition of plants, and which are not met with ready formed either in the atmosphere or in the soil.

The researches upon these various points are curious, important, interesting to practice as well as to science—and will lead us to explain, by means not yet appreciated, the action of lime upon vegetation.

Absorption by plants of the principles of the atmosphere, in the vegetation on uncultivated soils.

29. Saussure has concluded, from his experiments, that plants derive from the soil about one-twentieth of their substance; and the experiments of Van Helmont and of Boyle have proved that considerable vegetable products diminish very little the mass of the soil. But this fact is still better proved by the observation of what passes in uncultivated soils.

Woodland that is cut over in regular succession [*taillis*] produces almost indefinitely, without being exhausted, and even becoming richer, the mass of vegetable products which man gathers and removes, and of which the soil does not contain the principles. If, instead of woodland thus partially and successively cut over, we consider upon the same soil a succession of forests, and, for greater ease of estimation, resinous forests, we find for the products of the generation of an age, forty to fifty thousand cubic feet to the hectare. This product is less than that of the resinous forests of many parts of the country, and yet it is nearly equal in bulk to half of the layer of the productive soil itself: it represents an annual increase of 24,000 weight of wood to the hectare—and which is produced not only without impoverishing, but even while enriching the soil, by an enormous quantity of the droppings and remains of all kinds.

These products which do not come from the soil, are then drawn from the atmosphere, in which plants gather them by

* The author has been deceived by exaggerated accounts of injury from liming in America. It is probable that wherever it occurred, it was caused by the usual ignorance of the action of lime: from erroneously considering it as alimentary, and directly fertilizing manure, and after applying it, wearing out the soil by continued grain crops. Such effects are spoken of by Bordley.—[Ed. Far. Reg.]

means of particular organs designed for that use. These organs are the myriads of leaves which large vegetables bear—aerial roots, which gather these principles either ready formed in the air, or which take up there the elements, to combine them by means of vegetable power. But these aerial roots exert quite a different and superior energy in gathering the constituent principles of plants in the atmosphere, to that of the roots in the ground—since the former furnish nearly the whole amount of the vegetable mass, while the latter draw but very little from the soil.

30. Plants may well find in the atmosphere the greater part of the *volatile* principles which compose them—the carbon, hydrogen, oxygen, and azote. But it is not so easily seen whence they obtain the *fixed* principles of which their ashes are composed. These products could not exist ready formed in the soil—for the saline principles contained in the ashes of a generation of great trees, which would amount to more than 25,000 weight to the hectare, would have rendered the soil absolutely barren, since, according to the experiments of M. Lecoq of Clermont, the twentieth part of this quantity is enough to make a soil sterile. We would find a similar result in accumulating the successive products of an acre of good meadow. It is then completely proved that the saline principles of plants do not exist ready formed in the soil. They are no more formed in the atmosphere, or the analyses of chemists would have found them there. However, as the intimate composition of these substances is not yet perfectly known, their elements may exist in the atmosphere, or even in the soil, among the substances which compose them.

Neither can it be said that these salts may be derived from the atomic dust which floats in the air; for this dust is composed of fragments organic and inorganic, carried especially to the plants themselves, and then, in estimating this atomic matter at the most, we will scarcely find in it the hundredth part of the saline substances contained in the vegetable mass produced. We ought then to conclude that the saline substances of plants are formed by the powers of vegetation, or of the soil.

31. In like manner as with the saline principles, the lime and the phosphates of ashes ought to be due to the same forces, whether that the roots take up their unperceived elements in the soil, or that the leaves gather them in the atmosphere. This consequence results evidently from this fact—that plants grown in soils, of which the analysis shows neither lime nor phosphate, contain them notwithstanding in large proportion in their fixed principles—of which [or of the ashes] they often compose half the mass.*

Absorption of plants, in vegetation on cultivated soils.

32. Vegetation on uncultivated soils operates under conditions altogether different from those of the cultivated, so that the results receive modifications which it is important to examine.

Nature produces, and continues to produce, all the vegetable mass in spontaneous growth, without any other condition than the alternation and succession of the species. In vegetation on cultivated land, by bringing together the same individual plants which are to grow abundantly on a soil and in a climate which, in most cases, are not those which nature had designed, there are required besides the general condition of alternation of the species, frequent tillage of the soil, and means to repair its losses, that the culture may be productive, and be continued. However, with these new conditions, the force of absorption of plants on the atmosphere still furnishes the greater part of the vegetable principles in soils not limed—and still more in limed soils.

To form a precise idea, we will take it in the land of the writer, its culture and its biennial rotation. As the same qualities of soil are found elsewhere, as no particular circumstance increases or impairs its products, there would be found similar results, for the same qualities of soil, with a different culture. The inferences which we will draw from ours, will apply then to all others.

On our soil of the third class, [or worst quality] fallow returns every two years, with a biennial manuring of 120 quintals to the hectare. This mass contains more than four-fifths of water, which should not be counted as manure, and consequently the substance which serves for the reparation of the soil is reduced to 24 quintals. We reap, in rye, straw, and buckwheat, after the year of fallow, a dry weight of 40 to 50 quintals on an average. If it is supposed that all the manure is consumed, or employed in forming vegetable substance, still the soil would have furnished 18 to 20 quintals more than it received, and which excess would be due to the power of absorption, whether of the soil, or of the plants, on the atmosphere.

On land of middle quality, which yield a crop every year, with a double manuring, that is to say, of 48 quintals of dry manure, in two years, there is a product in wheat, maize, or potatoes, which amounts to from 12 to 15,000 weight, 120 to 150 quintals, of which two-thirds, or 80 quintals at least are derived from absorption.

On soils of good quality, with a manuring of one-third more than the last, which is equal to 64 quintals of the dry substance to the hectare, there are obtained of dry products, in grain, straw, roots, or hay, double of the last, or nearly so, of which three-fourths, or 180 quintals are due to the power of absorption.

Lastly—upon the most fertile soils, (*sols d'exception,*) where manures are useless, the product, often double, or at least half as much more than the last mentioned, will amount to 360 quintals to the hectare in two years. This product would be, as in spontaneous vegetation, entirely due to absorption.

We would have then, to represent the products of two years, in quintals, in the four classes of soil under consideration, the progressive amounts of 42, 130, 240, 360; or, by deducting from these products the weight of the manure, we would have, to represent the power of absorption, the progression 18, 82, 176, 360 quintals. From this is deduced, as the first conclusion, that, supposing the plants have consumed and annihilated all the substance of the manure given, (which is beyond the truth,) plants receive a much greater part of their substance from the atmosphere, than from the soil; and that this power of drawing food from the atmosphere increases with the goodness of quality in soils.

33. The proportion of fixed substances, or ashes, in agricultural products, is 43 lbs. to the 1000, and consequently, in our four classes of land, the quantity amounts to 180, 559, 1032, 1548 pounds. But the soluble saline substances form at least half of these ashes: they are then produced in the two years of the rotation, in the quantities of 90, 279, 516, 774 pounds. But, according to Kirwan, barn yard manure yields 2 per cent. of soluble salts: then the manure given to these soils contained 48, 96 lbs. 128 of saline substances, which being deducted from the preceding quantities, leave the four classes of soils stated 42, 183, 388, 774 lbs. of products in soluble salts, in two years of the rotation, gained solely by the absorbing forces of the soil and of plants.*

34. But, in the same soils, with the same manures and the same tillage, by the addition to the thickness of the ploughed layer of only one-thousandth part of lime, the products, whether volatile or fixed, are increased in a striking manner: the soil of the first named (or lowest) quality reaches the product of the second—the second rises one-half or more—and that of the best (of the manured soils) increases a fourth. Thus, our scale of product becomes 130,200,300 quintals—and deducting the manure, 106,152,236 quintals, for the two years of the rotation. The most fertile soil (*sol d'exception*) cannot receive lime beneficially because it contains it already; these lands all belong to alluvions, where the calcareous principle has almost always been found in greater or less proportion.

35. The product of fixed principles [as ashes] in the three classes of limed soils, would be 559,868,1290 pounds, and in soluble salts, 278,430,645 pounds; and deducting the soluble salts of the manure, the quantities would be 230,334,525. A light addition of lime has then doubled the force of absorption, and almost tripled the quantity of saline principles produced. One of the most remarkable effects of lime consists then, in making a soil produce a much greater proportion of saline principles: and if the experiments of M. Lecoq upon the efficacy of saline substances on vegetation are to be admitted, it would be in part to the phenomenon of their production that lime would owe its fertilizing effect.

36. It results from what precedes, that salts are formed in the soil, or in vegetables: thus we see every day the nitrates of potash and of lime form under our eyes in the soil, or elsewhere, without any thing indicating to us the origin of the potash which is contained. But potash itself again forms spontaneously in drawn ashes, according to the observations of the chemist Gelhen. We see salts also renewed in the artificial nitre beds, with the aid of moisture and exposure to the air. But it is the presence of lime that determines this formation more particularly. The nitrates abound in the ruins of demolished edifices; they are formed in the walls and in all parts of houses situated in damp places; they effloresce on the buildings of chalk in Champagne; they are produced spontaneously in the ploughed lands of the kingdom of Murcia. This effect, which we see that the calcareous principle produces every where, we think it produces in all the soils to which it is given, and where meet the circumstances which favor the formation of nitrates, viz: humidity, vegetable mould, and exposure to the air. But, according to the experiments of M. Lecoq, and others, and the opinion which is established of the old agriculturists, the nitrates are the most fertilizing salts. It would be then to their formation, which it promotes in the soil, that lime owes, in part, its effect on vegetation.

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* This fact is explained very differently by the Essay on Calcareous Manures (Ch. VII.) where it is used to sustain the doctrine of neutral soils.—[Ed.]

* The proportions of ashes of different plants, and of their saline matters, vary greatly—and the uniform proportions assumed above, are far from correct, even as averages of unequal proportions. This will sufficiently appear from the following examples extracted from Saussure's table of the products of various vegetable substances. (See Davy's Ag. Chem. Lec. III.)

37. The foregoing proofs of the daily formation in the soil, and by vegetable life, of saline and earthy compounds, taken in nature and on a great scale, are doubtless sufficient: but they may still be supported by the experiments and opinions of able men who have adopted the same system.

And first—in the experiment of Van Helmont, in five years, a willow of five pounds grew to weigh 169, and had caused a loss of only two ounces to the soil which bore it. But the 164 pounds which the willow had taken contained five pounds of ashes, which are due entirely to absorption, since the leaves and the other droppings of five years, which were not saved, would have given at least one pound of ashes, which makes up for, besides, all that which, in spite of the sheet of lead which covered the top of the vessel in which the willow grew, it might have received in the waterings, and from other fortuitous circumstances. Boyle has repeated and confirmed this experiment in all its parts.

		Constituents of 100 parts of ashes.					
Names of Plants.	Ashes from 1000 parts dry.	Soluble Salts.	Earthy Phosphates.	Earthy Carbonates.	Silicia.	Metallic Oxides.	Loss.
Wheat, in flower,	—	43,25	12,75	0,25	32	0,5	12,25
Do. seeds ripe,	—	11	15	0,25	54	1	18,75
Do. seeds ripe,	33	10	11,75	0,25	51	0,75	23
Straw of wheat,	43	22,5	6,2	1	61,5	1	78
Seeds of do.	13	47,16	44,5	—	0,5	0,25	7,6
Bran,	52	4,16	46,5	—	0,5	0,25	8,6
Plants of maize, (Indian corn,) a month before flowering,	122	69	5,75	0,25	7,5	0,25	17,25
Do. in flower,	81	69	6	0,25	7,5	0,25	17
Do. seeds ripe,	46						
Stalks of do.	84	72,45	5	1	18	0,5	3,05
Spikes, (tassels,) of do.	16						
Seeds of do.	10	62	36	—	1	0,12	0,88
Oats(entire plant),	31	1	24	—	60	0,25	14,75

The proportion of soluble salts, 2 per cent found by Kirwan in barn-yard manure, however correctly ascertained in a particular case, can no more be relied on as a fixed and uniform proportion, or even a true general average, as used by M. Puvis in the estimates above.—[Ed. Farm. Reg.]

Lampadius, in different isolated compartments, some filled with alumine, others with silex, others with [carbonate of] lime, all pure, has made to grow plants, of which, the burning has yielded to analysis like results, and which, consequently, contained earths which were not in the soils which bore them.

Saussure, in establishing that plants do not take in the soil more than a twentieth of their substance, in extract of mould and in carbonic acid, has necessarily established, by the same means, that almost the whole amount of fixed principles do not proceed from the soil.

Braconnot has analyzed lichens, which contained more than half their weight of oxalate of lime—and he has observed others covered with crusts of carbonate of lime, when there was none of this earth in the neighborhood.

Shrader, in burning plants grown in substances which did not contain any earthy principle, has found in their ashes, earths and salts which were neither in the seeds sown, nor in the pulverized matters in which the plants grew.

Lastly—the analyses of Saussure, though showing more of the carbonate of lime in the ashes of plants which grew on calcareous soils, than on soils not calcareous, yet nevertheless, they have formed more than a sixth of the ashes from vegetables on silicious soils—and Einhoff has found 65 per cent. of lime in the ashes of pines grown on silicious soil.* The labors of science then confirm what we have above established, that plants, or the soil, form salts and earths.†

38. The fertilizing effect of fallow, or ploughing, of moving and working the soils prove still more that all these circumstances determine the formation of fertilizing principles, and probably of saline principles, in all the parts of the soil which receive the atmospheric influences.

But salts are also formed in plants. The nitrate of potash, which takes the place of sugar in the beet—the oxalate of potash, so abundant in sorrel—the carbonate of potash in fern, in the tops of potatoes, and in almost all vegetables in the first period of their life—the sulphate of potash in tobacco—the nitrate of potash in turnsole and in pellitory—prove, without reply, that vegetation forms salts, as it forms the proper juices of plants, since the soil contains the one kind no more than the other. But can we say where plants take the elements necessary for all these formations? They can take them only in the soil by means of their roots, or in the atmosphere—in the soil, which would itself take them in the atmosphere, in proportion to the consumption of plants—or directly in the atmosphere by means of their leaves which would there gather these elements. And if the analyses of the soils, and of the atmosphere, show almost none of these elements, it will be necessary to conclude from it, that the substances which analysis has found there, are themselves, or would furnish, if decomposed, the elements of the saline substances, although science may not yet have taught us the means of reaching that end.

39. The formation of lime, like that of the saline principles necessary to plants, is an operation which employs all the forces of vegetation—and these forces, directed to this formation, have no energy left to give a great developement to plants: but when the vegetable finds the calcareous principles already formed in the soil, it makes use of them, and preserves all its forces to increase its own vigor and size.

It would then result, from all that has been said, that lime modifies the texture of the soil—makes it more friable—invigorates it—renders it more permeable—gives it the power to better resist moisture as well as dryness—that it produces in the soil the humate of lime which encloses a powerful means of fertility—that lime increases much the energy of the soil and of plants to draw from the atmosphere the volatile substances of which plants are composed, oxygen, hydrogen, carbon and azote—that the limed soil in furnishing to plants the lime which they need, relieves the soil and plants from employing their powers to produce it—and finally, that lime promotes the formation of fixed substances, earthy or saline, necessary to vegetables. All this whole of reciprocal action and reaction of lime, on the soil, plants and atmosphere, explains in a plausible manner, its fertilizing properties. We would, consequently, have nearly arrived at the resolving of an important agricultural problem, upon which were accumulated all these doubts.

The amount of lime taken up by vegetation.

40. The ashes of plants from calcareous soils, or those which have been made so by manures, contain 30 per cent. of the carbonate and phosphate of lime, which, by taking off the crop is lost to the soil. But the product of limed land of middle quality, is during the two years of the course of crops, about 20,000 lbs. of dry products to the hectare, which contain a little less than a hectolitre of lime in the calcareous compounds of the ashes. The vegetation has then used half a hectolitre a year. But we have shown that there was necessary, on an average, three hectolitres per hectare, each year. Vegetation then does not take up, in nature, but a sixth of the lime which is given profitably to the soil; the other five-sixths are lost, are carried away by the water, descend to the lower beds of earth, are combined, or serve to form other compounds, perhaps even the saline compounds, of which we have seen that lime so powerfully favors the formation. Another portion, also, without doubt, remains in the soil, and serves to form this reserve, which in the end dispenses, for many years, with the repetition of liming.

Of the exhaustion of the soil by liming.

41. "Lime," it is said, "only enriches the old men: or it enriches fathers and ruins sons." This is indeed what experience proves, when, on light soils, limed heavily, or without composts coming between, successive grain crops have been made without rest, without alternations of grass crops, or without giving to the soil alimentary manures in suitable proportion. It is also what has happened when magnesia, mixed with lime, has carried to the soil its exhausting stimulus. But when lime has been used in moderation—when, without overburdening the land with exhausting

* It is presumed, from the context, that these silicious soils, were not the least calcareous.—[Ed. F. R.]

† Van Helmont's experiment, cited first in the list above, like M. Puvis' reasoning in general, furnishes ample proof that most of the volatile parts of vegetables, and the greater part of their bulk, are drawn from the atmosphere—and they are equally defective in proving that earths and other fixed principles are thence derived, or are formed by the power of vegetable life Distilled water is not entirely free from earthy matter, and if it had been used for watering the willow, it would in five years have given some considerable part of the five pounds of solid matter in the ashes. But as we are not told that it was either distilled or rain water, it may be inferred that the comparatively impure water of a fountain or stream, was used for watering the plant, and which would more than suffice in so long a time, to convey the whole increase of earthy and saline matter. The experiments of Lampadius and Shrader are liable to the same objection—and the former to this in addition—that his earths were deemed absolutely pure, when, in all probability, they were not so—and that a very slight admixture of other kinds with each, would furnish the minute quantity that a small plant could take up during its short and feeble existence under the circumstances stated. The results stated of the experiments of Braconnot, Saussure and Einhoff, may be, and probably are, entirely correct—but they are fully explained by the doctrine of neutral soils, and need no support from, and give none to our author's doctrine of the formation of lime by vegetable power.

But though deeming M. Puvis altogether wrong in this, his main and most labored position, and that the proofs cited above, as well as some others in the preceding section, are of no worth, still these pages which present his theory, contain what is of more value. He places in a strong point of view the important truth that the atmosphere is the great treasury of nature, from which nature doubles and triples the amount of all the small portions given to the earth by the industry of man. The author's scale of actual products from different grades of soil is also interesting. It sustains the position assumed in the Essay on Calcareous Manures, that the worst soils are liemd (or made calcareous) to most profit—and that alimentary manures, when needed, are most productive on the best soils.—[Ed. Far. Reg.

crops, they have been alternated with green crops—and that manure has been given in proportion to the products taken off—the prudent cultivator then sees continue the new fecundity which the lime has brought, without the soil showing any sign of exhaustion. No where has there been complaint made of argillaceous soils being damaged by lime; and the productiveness of light soils is sustained, in every case that the lime was used in compost.

In America, where the lime of oyster shells has taken the place of that of magnesian limestone, the complaints of the exhausting effects of lime have ceased.

*Healthiness given to the soil and to the country by calcareous agents.**

42. The unhealthines of a country is not caused by the accumulation of water, nor from soil being covered by water. Places on the borders of water do not become sickly but when the water has quitted some part of the surface which it previously overflowed, and the summer's sun heats the uncovered soil, and causes the decomposition of the remains of all kinds of matter left by the water, and contained in the upper layers of the soil. Thus, ponds are not unhealthy but when drought, by lowering the waters, leaves naked extensive margins, to be acted on by the sun and air. In rainy years, fevers on the borders of ponds are rare.

Epidemic diseases most often arise on the borders of marshes laid dry—in the neighborhood of mud thrown out of ditches or pits—and in the course of bringing new land into cultivation, where the ploughed soil is for the first time exposed to the summer's sun. In the interior of Rome, the vineyards, the gardens are remarkably unhealthy—while the sicklinesss disappears where the emanations from the soil are prevented by buildings. In the Pontine marshes, they cover the dried parts with water to arrest the danger of their effluvia. It is then from the soil, and not from the waters at its surface, that insalubrious emanations proceed. Waters placed on the surface, always in motion, agitated by every wind, are not altered in quality, and do not become unhealthy: but whenever they are contained in some place without power to receive exterior influences, or to have motion, they are altered in their odor, taste, and consequently injured in relation to health.

Whenever water then, without covering the soil, penetrates the upper layer without being able to run through the subsoil, it remains without motion, and stagnant, within the soil—is changed by the summer's sun, serves to hasten the putrefaction of the broken down vegetable remains in or on the mould, and the exhalations from the ground become unhealthy. Thus are all drained marshes, of which the surface only is dry, while the water still penetrates the subsoil—thus, all the margins of rivers which have been covered by recent inundations of summer, are unhealthy: thus also, (for a great and unhappy example,) the argilo-silicious plateaux, whenever the closeness of the subsoil does not let the water pass through, produce, in dry years, at the close of summer, emanations which attack the health of the inhabitants.

43. But this unhappy effect appears almost no where in calcereous regions: the margins of lakes and ponds there situated do not produce the same unhealthiness, and even the marshy grounds there are less unhealthy.

The waters which spring out of, or run over calcareous beds, are always healthy to drink. The borers of Artesian wells are anxious that the water which they obtain, to be good, may come out of the calcareous strata which they go through. When the waters which hold carbonate of lime in solution in carbonic acid* run over the surface, they give health to the meadows, in changing the nature and quantity of the products.

Linnæus thought that the unhealthiness of most countries depended on the nature of the water, and was owing to the argillaceous particles which they contain; now these argillaceous particles are always precipitated by the calcareous compounds. For this reason, the waters which stand upon, or run over marl, or calcareous rock, are almost always limpid and clear, because the argillaceous particles have been precipitated by the effect of the solution in the water of the calcareous principle, which is itself dissolved by an excess of carbonic acid.

We are not far from believing then, that throwing rich marl, or limestone, into a well of muddy and brackish water, might have the effect, in part at least, of clearing it, and making it healthy to drink. This remedy, if it should not be as useful as we think, at least could not produce any injury.

Lime, in all its combinations, destroys the miasmata dangerous to life. Its chloride annihilates all bad odors, arrests putrefaction, and in short, has subjected the plague of Egypt to the skill and courage of Pariset. The white wash of lime upon infected buildings, upon the walls and mangers of stables, is regarded as serving to destroy the contagious miasmata of epidemic and epizootic diseases.

Lime destroys the plants of humid and marshy soils, and makes spring those suitable to better soils: then its effect is to give healthines or vigor to the soil, to dry it, and make it more mellow and permeable. The water then is no longer without motion, and altered consequently in its condition. The limed soil then, to the depth it is ploughed, ought to change the nature of its emanations, as well as its products: and if the lower strata or subsoil, send up emanations, these effluvia in passing through the improved layers of soil, where the calcareous agent is always at work, and developing all its affinities, ought also to be modified, and take the character of those of the upper bed. The limed soil then, it would seem, ought to be made healthy.

But what we maintain here by induction, by reasoning, is fortunately a fact of extensive experience. Among all the countries in which lime has carried and established fertility, there is not cited, that I know of, a single one where intermittent fevers prevail—while that they have not disappeared in the country even where an active culture draws good products from the impermeable argilo-silicious soil.

44. To extend the great benefit of healthiness to the whole of a country, it is no doubt necessary that the whole coutry should receive the health-giving agent. However, on every farm, in proportion as liming is extended over its surface, the chances of disease will be seen to diminish—and the healthiness of the country will keep pace with the progress of its fertility.

Result of the use of improving manures on the soil of France in general.

Three-fourths of the whole territory of France, to be rendered fruitful, have need of calcareous agents. If the third of this extent has already received them, (which we believe is above the truth,) upon the other two-thirds, or the half of the whole, the agricultural products, by this operation, would be increased by one-half or more, or one-fifth of the total amount. But agriculture, in enriching itself will increase its power, its capital, and its population, and will naturally carry its exuberant forces, its energy and activity to operate on the greater part of the 7,000,000 of hectares of land now [*en friche*] untilled, waste, and without product. By bringing these lands into cultivation and fertilizing them by liming or by paring and burning the surface, they would be made to yield, at least, one-sixth of the total product. The gross product of the French soil, then increased by a third or more, might give employment and sustenance to a population also one-third greater than France now possesses; and this revolution due successively to the tillage of the soil, to annual improvements keeping pace with the progressive increase of crops, would be insensible. The state would grow in force, in vigor, in wealth, in an active and moral population, which would be devoted to peace, and to the country, because it would belong to this new and meliorated soil. And this great result would be owing simply to applying calcareous manures to the extent of the soils of France which require them!

46. Upon our extent of 54,000,000 of hectares, our population increased to 44,000,000, would have for each, one hectare and a quarter, and would be less confined than the 24,000,000 of inhabitants of the English soil, who have only one hectare to the head; and yet our soil is at least as good, and it is more favored by climate. And then our neighbors consume in their food, at least a fourth or fifth of meat, while only one-fifteenth of the food of our population consists of meat; and as there is required twelve or fifteen times the space to produce meat as bread, it follows that twice the extent of soil is necessary to support an Englishman as a Frenchman. Hence it results, that with an increase of one-third, our population would still have a large surplus product which would not exist in England, with an equal increase of population and equal increase of products of agriculture.

But this prosperity of the country, (yet far distant, but towards which however, we will be advanced daily,) would be still much less than in the department of the North, where a hectare nearly supports two inhabitants. And yet they have more than a sixth of their soil in woods, marshes, or unproductive lands: they have besides, another sixth, and of their best ground, in crops of commerce, which consume a great part of their manure, and which are exported almost entirely. This prodigious result is, without doubt, owing in part to a greater extent of good soil than is found elsewhere;

* There was no position in the Essay on Calcareous Manures which its author assumed with so much hesitation as the agency of those manures in removing causes of disease. That hesitation did not arise from doubt of the truth of the position—but because of its very high importance, and its entire novelty—its being then sustained but by few known facts furnishing direct evidence, and by no known authority whatever of earlier writers. It is therefore the more gratifying to find in the work now presented, that about the same time, another and far remote investigator of the same subject, by a different course of reasoning, and by different proofs, had arrived at precisely the same conclusion—and that he maintains even more generally than the former work, the important and sure effects of calcareous manures in rendering a country more healthy.—[Ed. Far. Reg.]

* As in limestone water, lime with the greatest proportion with which it can combine of carbonic acid, (forming super-carbonate of lime,) is soluble in water. The excess of acid is lost by heat, by exposure to air, &c., and then the lime is in form of carbonate—and being insoluble in water, falls separate to the bottom. —[Ed. Far. Reg.]

but it is principally owing there, as well as in England, to the regular use of calcareous manures. As we have seen, more than two-thirds of this country [the North] belongs to the class of soils not calcareous, to the argilo-silicious plateaux, and makes use of lime, marl, or ashes of all kinds.

47. After this great result of increased productiveness, that upon health, although applied to the least extents of surface, would be most precious. Upon one-sixth of our country the population is sickly, subject to intermittent and often fatal fevers, and the deaths exceed in number the births. Well! upon this soil without marshes, calcareous manures would bring a growing population, more numerous than that of our now healthy parts of the country—and as labor would offer itself from every side, these regions, made healthy, would soon be those where the people would be most happy, the richest, and the most rapidly increasing in numbers.

48. If we are not under an illusion, the calcareous principle and its properties upon the soil, form the great compensation accorded by the Supreme Author to man, in condemning him to till the earth. Three-fourths of our soil seem not to produce, except by force of pain and labor, the vegetables absolutely necessary for man. On all sides, and often beneath this surface so little favored, is found placed the substance necessary to the soil, to render it as fertile as the best ground, to enable the cultivator to use for his profit the vegetable mould which it contains and has been accumulating for ages—and to cause the entire soil to be covered by a population active, moral, and well employed. And this precious condiment, this active principle of vegetation, is only needed to be applied in small proportions, to obtain products of which the first harvest often compensates for all the labor and expense. And to complete the benefit, insalubrity, which afflicts the infertile soil, disappears; the new population finds there at the same time strength, riches, and health. There, without doubt, is one of the most happy harmonies of the creation, one of the greatest blessings with which the Supreme Author has endowed the laborious man who is devoted to the cultivation of the earth.

We had marked No. 1 of this series of letters on Sheep Husbandry, before the conflagration; but it was in *ashes* before we could put it in *type*, and therefore, we are compelled to commence with No. 2, which we regret, as we desire to give the series entire. They evince much valuable information upon the subject to which they relate, and should be carefully read by every sheep grower.

From the Cultivator.

SHEEP HUSBANDRY.

No. II.

The common sheep of Spain have coarse light fleeces, being worth from 10 to 12 cents per pound, and reared principally for their flesh.

"The word *Merino* is Spanish, it signifies governor of a small province, and likewise him who has the care of the pasture and cattle in general. The *Merino Mayor* is always a person of rank, and appointed by the king; the duke of Infantado is the present *Merino Mayor*."

The *mayors* have a separate jurisdiction over the flocks in Estramadura, which is called the *mesta;* and there the king is the merino mayor. Each flock consists of 10,000 sheep with a mayor or head shepherd, who must be an active man, well versed in the nature of pasture, as well as in the diseases of his flock. It might be interesting to some to pursue this part of the subject further, but I fear encroaching on the limits of your paper; if it should excite an interest to consult standard authorities and investigation, my present object will be attained.

The word *merino* is now by general usage applied to the fine wooled Spanish sheep.

From the earliest history of Spain, the possession and cultivation of a peculiar breed of fine wooled sheep has been a subject of high national legislation, and although it was carried to an extent greatly oppressive and injurious to some other interests, yet it resulted in preserving and improving their sheep above those of the whole civilized world.

The origin of the fine Spanish sheep, as stated in the preceding number, is yet left for ingenious investigation.

Strabo, speaking of the beautiful woolen clothes that were worn by the Romans, says that the wool was brought from *Truditania*, in Spain. After the conquest of Spain by the Romans, the elder Columella was one of the early emigrants to Spain. For "Spain was at that time highly civilized; and agriculture was the favorite pursuit of all who were not occupied in war." How desirable is it that our country should properly appreciate this great source of happiness, wealth and true greatness.

Mr. Tessier, a distinguished member of the French Institute, and who was commissioned to investigate this subject, says, "all that we know of the *merino* is, that they have a long time existed in Spain; the *merino* is a distinct breed of sheep; as in the class of dogs, the Danish dog, the grey hound, the shag dog, the lap dog, &c. And in the same manner as among dogs, the cross breeds may afford individuals more or less approximating to the species, but never the species itself." Another writer says, "the *merino* differs more essentially from every other kidd of sheep, than the spaniel does from the mastiff And yet no one has seen any change in either of those species of dogs in the course of generations, or in any climate, except by intermixture of the breeds. I say the *merino* differs essentially from all other sheep, and even from all other quadrupeds of which we have any knowledge, as an annual does from a perennial plant. All quadrupeds change their coats every year, and indeed generally twice a year; the *merino* sheep never changes his coat, on the contrary, it will continue to grow from year to year, and at the end of the third year, the fleece will yield a three years' crop, with little or no diminution. This has been tried in France, Switzerland, and England."

Sportsmen, for the purpose of the chase and the turf, well understand their business, in breeding the grey hounds and blood-horses. Will the deliberate scientific agriculturist be shamefully distanced in the comparison of his pursuit with that of play and recreation? Will he rear a cock that will not fight on his own dunghill? Excite an interest, raise a competition, and any subject at this day will be investigated. Let us observe the course which nature treads.

"God never made his works for man to mend."

I would, with Franklin, conduct the lightning harmless down, but not in folly strive to stay its force.

Mr. Livingston says, "It will be of use to be acquainted with the several breeds of Great Britain and Spain, as a direction to those who may endeavor to import sheep from thence; for though every *variety* of the *merino* is valuable, yet they differ widely from each other in beauty, in form and in fineness of fleece, as may be judged from the prices in Spain, where Leon and Escurial wool sells for 100 cents, while that of Arragon brings only 60 cents, with several intermediate kinds."

The principal flocks of Spain are divided into the (*Transhumanta*), or which migrate from north to south twice every year, and include the greatest number, their route having been regulated from time immemorial by legislation. The privilege of a route ninety paces wide across the cultivated fields, is claimed and maintained by the government for the passage of the public flocks.

Then the (*Estantes*), or stationary flocks. These are next subdivided into several varieties and denominations, originating either in ownership or locality of production, of which the most prominent are the following, viz:

Those of the Escurial convent are altogether the finest and most perfect of any of the Spanish flocks, combining excellence scarcely admitting of improvement.

Those of the duke Infantado and of the countess Negritti are but imperfectly known in this country.

Those of the Monturio and Gaudaloupe, of those brought to this country, rank next to the Escurial in their most essential qualities.

Those of the Paulaur convent. Of all the Spanish flocks this is the largest sheep, elegant in form, and producing the greatest fleece, but at the same time, coarse, and abounding in jarr and yolk. He has a large dew-lap extending from the chin to the breast. This wool, though not answering the full requirement of the market, nor meeting the nicety of modern machinery; still, however, standing in advance of all crossing with Dishly, Lincolnshire, or other mongrel productions, and of all others are the most rugged and hardy, almost answering the requirement of a *sheepman*, who thinks sheep require no care.

I have seen some fleeces of Paulaur bucks highly fed, weighing, unwashed, twelve and fourteen pounds.

Besides these, there are many other flocks which I shall omit to describe.

The *emigrant merino* will form the subject of the next paper. F.

From the Harrisburg Intelligencer.

IMPORTANT DISCOVERY.

In our last, we noticed the important discovery of Peter Ritner, Esq., of smelting iron ore with mineral coal. It will be a new era in the iron manufacture in this country. The moment we pass the Alleghany mountains, running from northeast to southwest, nearly through the middle of the State, we come into the bituminous coal region. The rocks in this region, reaching to the Rocky mountains, are horizontal, and frequently alternate with iron ore and bituminous coal. This is the case at Karthaus, on the west branch of the Susquehanna, a few miles above the termination of the canal extending to Philadelphia. The process of smelting iron ore with mineral coal, has for some time been known in Europe, and it has been on this account that one kind of iron could be made in Great Britain, and sold in this country under a duty of $30 per ton. Thousands of dollars have been

expended in this State, and hundreds of enterprising men have been ruined, in their experiments to discover this method of making iron. A year or two ago, the Legislature incorporated a company, with an immense capital, to make the experiment, as it was thought to be beyond individual enterprise.

At length, however, Peter Ritner and Joseph Loy, with limited pecuniary means, have erected a furnace on the plan of the coke and iron furnaces of Wales, and succeeded in making the finest iron for foundry and many other purposes.

Mr. Ritner is a brother of the Governor of Pennsylvania.

HEIGHT OF WAVES.—Among other proofs of the incorrectness of the assertion, that no waves rise higher than ten feet above the ordinary level, the following vivid description is given:—"During the hurricane experienced to the Northward of Barbadoes by the squadron under the command of the late Admiral De Courcy, (in July 29, 1805,) the *Centaur*, a seventy-four of the largest class, whilst lying-to, had the small boat (a gig,) which was hoisted up at the stern davits, washed away, as well as the poop-lantern, by an enormous wave, which was elevated *many feet* above the highest part of the ship's hull, as it rushed past with impetuous velocity; the portion which struck the ship cleared the poop-deck of every thing!—On the evening of the second day, whilst the hull of our shattered and unwieldy vessel lay rolling in the trough of the sea, the cry of one of the look-out men, of 'a ship coming down upon us,' made those who were holding on, under the shelter of the weather bulwark, spring from their covert to get a peep of the scudding vessel. We jumped upon a carronade, and, with the greatest difficulty, held on, directing our eyes upwards to the position where the stars of the mid-heaven would have been sought for on a calm and clear night! and indistinctly saw a dark object upon the ridge of the towering wave, which was approaching on the weather-quarter. The next minute, a large ship (the *St. George*, 98,) dashed close past our stern with a rapidity perfectly astounding; and, before the eye could be well turned to leeward, she was almost out of sight. The danger was imminent, and, but for the providential circumstance of the *St. George's* helmsman catching a momentary glimpse of the *Centaur*, under the foot of the former's foresail, our doom, and theirs too it is probable, had been sealed. One *spoke* of the wheel to port saved us, and barely so, for the giant ninety-eight's proximity was alarmingly close, in her desperate flight before the furious tempest! If any dependence can be placed upon our eyesight in broad daylight—when much of the heightened peril of the storm seemed to have lessened with the departure of the night—and from intent contemplation, for some hours, of the successive *seas* as these came rushing and doubling onwards, as it were, to wipe away with one brush of their curling and foaming, the glorious and inglorious works of man, which lay like a helpless log at their mercy—we would say, that if a horizontal line had been drawn from the apex of the loftiest wave to the ship, it would have intersected the mainmast about half way up from the deck; which, making allowance for unavoidable error, would give about fifty feet for the elevation of the wave."—[Nautical Mag.]

FRIBOURG SUSPENSION BRIDGE.—M. Arago, in a paper descriptive of this bridge, read lately to the French Academy, which agrees in all material respects with that contributed some time ago to this Journal by Mr. Terry, C. E. (See vol. xxiii., p. 50;) makes the following comparison between it and the Menai Bridge:—"The only bridge which, for its dimensions, can be compared with that of M. Challey, is the Menai Bridge, built by the late Mr. Telford, and which joins the Isle of Anglesey to England. The largest ships can pass under this bridge at full sail. But the breadth of the Menai Bridge is only 167½ metres, 516 feet—consequently 301 feet less than that of Fribourg. The surface of Mr. Telford's bridge is about 33½ metres, or 100 feet above the level of the sea at high water. That of M. Challey is 51 metres, or 156 feet above the bed of the Sarmi. M. Candolle has taken the city of Paris as a standard, by which to convey an idea of the magnitude of M. Challey's bridge. He supposes a bridge of only one single span, the length of which shall be equal to the railing of the Carousel, or to the distance between the two corresponding carriage entrances of the two galleries, the level of this bridge being somewhat lower than the height of the towers of Notre Dame, or eight metres higher than the column of the Place Vendome, and you may thus have some notion of the height and length of the bridge at Fribourg."

We have much cause to rejoice at the great advance which has been made in Prussia within these few years in the manufacture of machinery. It is not very long ago that, for almost every large machine, we required help from England, and had the greater part from that country. Now an entire change has taken place in this respect, and the great establishment of this kind in Berlin furnishes the most complete and admirable machines at far lower prices than in England. These happy results we owe to the zeal of Privy Councillor Beuth, who, as President of the Mechanics' Institution, and Director of the Department of the Interior, does every thing to favor and improve the construction of machines. —[Frankfort paper.]

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D. K. MINOR, Editor.] SATURDAY, FEBRUARY 20, 1836. [VOLUME V.—No. 7.

CONTENTS:

AMERICAN RAILROAD JOURNAL.

NEW-YORK, FEBRUARY 20, 1836.

☞ New-York, March 10th.—It will undoubtedly be borne in mind by our readers, that the Journal is yet several weeks behind its regular time. This number (7), dated February 20th, is printed on the *10th of March*. We shall be able however in a few weeks to recover the time lost.

We acknowledge the receipt of the Report of the Baltimore and Susquehanna Railroad Co., and that of the Commissioners of the Wabash and Erie Canal; and among several communications, that of A. C. respecting the Portsmouth and Roanoke Road. We are much indebted to him for the information so kindly given, and think that he may safely venture another without fear as to our "taking it in good part."

We would take this opportunity to say to our friend that we will be angry at no one, having the hardihood, the audacity, to send us information; on the contrary, "the smallest favors" in that way are thankfully received: Reports, proceedings, charters, and any sort of intelligence in reference to Canals, Railroads, and Mechanics in general—in return, they shall have our hearty thanks, and as much information as we can give in return.

Lead Ore.—We have now before us, through the politeness of Joseph E. Bloomfield, Esq., one of the finest specimens of *lead ore* that we have ever seen. It was taken from a bed recently discovered in the town of Rossie, St. Lawrence Co., in this State, which is believed to be inexhaustible and of the richest kind. The specimen before us, it is believed, will yield 75 per cent. of first rate lead.

This discovery adds another to the many powerful arguments which might before be used in favor of the Black River Canal.

The Ogdensburg Times says that the lead mine at Rossie proves to be very rich in quality, and to all appearances inexhaustible; and that, with the labor of four or five men about three weeks, an amount of three hundred tons of ore, or thereabouts, has been uncovered, which will yield from 65 to 75 per cent. of pure lead. The vein stretches across the hills about two miles from the village of Rossie, being from one and a half to three and a half feet wide on the face, and appearances indicate that it extends to a great depth.

Our New-Jersey friends, notwithstanding their dread of monopolies, and in particular of the Camden and Amboy Railroad and Delaware and Raritan Canal, have determined, by their representatives in State Legislature assembled, not to "abate the nuisance;" in other words, the "proposition" of the united Companies to sell out to the State, has been rejected.

Some of those disposed to bring about such an arrangement, express regret that the bill should have been rejected at once, and without some attempt at amendment.

We would call attention to the following advertisement:—

For the Railroad Journal.

BALTIMORE, 16th Nov. 1835.

D. K. MINOR, Esq.

Sir,—The subscriber, having invented an improved Rail-track, and also an improved Railroad Car-wheel, is desirous, through the medium of your columns, to make known the general outlines of his plans, and when his leisure will permit, a more detailed specification of them.

Improved Rail-track.

Various plans have been adopted in the United States for the construction of Rail-tracks, each of which has its respective advantages and disadvantages, and so obvious is it that the advantage which one possesses over the other, is gained by the sacrifice of some principle which it is desirable to maintain, that it is difficult, if not impossible, to decide which is in the whole superlatively good.

Some Engineers contend for the superiority of tracks made entirely of stone and iron, and rest their opinions on the important fact of using no perishable materials. Others believe that tracks made wholly of wood and iron are generally the best, on account of their lesser first cost, and wear of the machinery which plies upon them.

The objections to the former plans are, their unyielding nature, and their liability to short settles. To the latter, their want of stiffness, and the perishable nature of their component parts.

In the construction of Rail-tracks, it is desirable—First, That their bearings should be of uniform solidity; second, That the rails which rest upon them should have their joints perfectly broken, so that the weight of each car passing over them, may at all times be distributed on at least three supports; third, That the foundations should be of unperishable materials, and no part of them above the surface of the ground, so that they may be stable, and not interfere with the formation of a horse-path, where one is necessary; fourth, That there should be in them some spring, but not enough to make a perceptible increase of motive power necessary; fifth, That any wood which is used in their construction should be elevated above the surface of the ground, its durability being decreased one-half by coming in contact with it; sixth, That the verticle pressure of the cars should be nearly over the centres of the bearings and rails, so as to prevent a disposition to tilt; seventh, That the rails should be occasionally tied, so as to counteract the disposition to spread; eighth, That they should be so constructed as to offer the greatest possible facilities for adjustment. Many of the tracks which have been constructed possess some of these desiderata in great perfection; by one of the following description, it is believed they all may be obtained at a moderate expense.

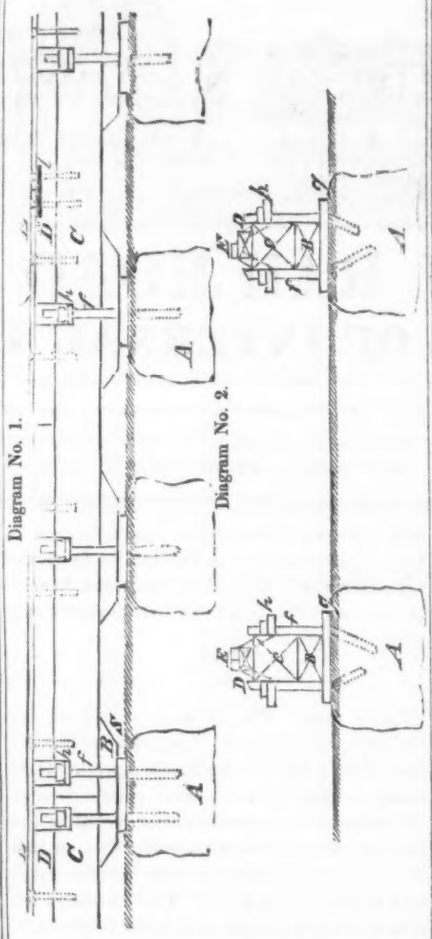

Diagram No. 1 represents a longitudinal, and diagram No. 2, a transverse section of the rail-track. A, A, &c. are stone blocks bedded in sand or gravel, three feet apart from centre to centre lengthwise of the track, and every fifth one extending entirely across the track. Their tops coincide with the surface of the ground. After they have been brought to a bearing with a common maul, they are to be consolidated by raising a given weight a given height, and letting it fall a given number of times on each block; the degree of consolidation to depend on the texture of stone. B, B, &c., locust rests, 1 foot 9 inches long, by 6 inches wide, by 3 or 4 inches deep, the depth to regulate the level of the upper surface of the rails. C, C, &c., 6 by 6 inch southern yellow pine, strong pieces. D, D, &c., 2 by 3 inch seasoned white oak strips. E, E, &c., iron plate rails, spiked with 5 inch spikes to the timber below them. F, F, &c., inch screw bolts, bent at their lower ends and inserted in oblique holes drilled for their reception in the stone blocks, the holes nearest the centre of the track to be 6, and those farthest from it 4 inches deep. G, G, &c., iron plates 10 inches square, by ½ an inch deep, preventing the screw bolts from approaching each other at their bases, and affording a smooth bearing for the locust rests. H, H, &c., iron caps 2½ inches wide by ½ an inch thick, confining the oak strips in their right position on the string, preventing them from splitting, and preventing the screw bolts from separating at their tops. I, I, &c., plates on which the plate rails rest at their joinings, provided with a shoulder equal in height to the thickness of the iron rail, which confines them in their proper position at their joining, and hooks their joints.

It is proposed to consolidate the stone blocks with an engine fixed on a carriage, so arranged as to raise two weights at once, and provided with an *anchor* fixed in advance, to which a cord is to be attached, from a drum on the engine, by means of which the carriage can easily be moved forwards: a further description of the engine is deferred for the present. It is believed that great advantage will result from this mode of consolidating the blocks, and that it is the only mode by which they can be got of uniform solidity. What slight dressing is necessary for the reception of the plates may be done after they are down, and it will be perceived that a variation in their height will only involve the necessity of varying the length of the screws, and the thickness of the locust rests. That uniformity in the size, and shape of the blocks which is common, is rendered unimportant by this mode of construction. A track well laid in this manner, on dry solid ground, can settle but little, if it settles at all, and in case of settles can be restored with facility to its proper position by loosening the screws, and inserting a piece of timber under the locust rests. The *bits* which the screw bolts have on the stone, effectually prevents them from drawing out, yet they can be removed with great ease when necessary. In case heavy iron rails are used, the white oak strips are unnecessary; if the road be much curved, it may be economical to use a heavy iron rail for the exterior, and a plate rail with oak strips, for the interior rail of the curve.

Improved Car-wheel.

Diagram No. 3 represents a double *flanged* car-wheel; *a* is the *cylindrical* part of the wheel, *b* the *cone*, and *c* and *d* the flanges. The object of the double flange is to decrease the liability of cars to run off the track. Each of the flanges we will suppose of the usual depth. Now suppose an obstruction on the rail which would raise the wheel high enough to clear the

first flange, that flange would fall on the top of the rail, and the wheel for a moment would roll on it, but with such an increased diameter as would restore it in half a revolution to its proper position. The effect of this is so obvious and simple, that a further description is deemed unnecessary.

Respectfully,

S. D. Steele.

In our last we referred to the New-Castle Manufacturing Company. We now give the names of the gentlemen who have the direction and management, and the Agent's circular.

Directors.

Geo. B. Rodney, President
John Moody } of New-Castle.
Thomas Stockton
Charles I. DuPont, of Brandywyne.
William D. Lewis, of Philadelphia.
James Cowper, jr., Secretary and Treasurer.
E. A. G. Young, Superintendent.
John D. Bird, Assistant Superintendent.

Mr. Young, who has charge of the whole establishment, is, we understand, an experienced and successful builder of Locomotive Engines, and an able and skilful mechanic. From his talent and character there can be no doubt, we should think, as to the quality of the work which he shall send forth from the Company's shop.

New-Jersey Railroad.—Notwithstanding the violent snow storm on Wednesday, the 17th inst., the locomotive "Newark," performed her regular trips through in gallant style. Buy out the Monopoly, or not, the admirable location, and great advantages to be derived from this road through to Philadelphia, ought to be completed.—The "People" *ask* it! Four passenger cars arrived in Rahway, on Saturday, with over over one hundred passengers. The whereabout of the termination of the Railroad presented quite a lively scene.—[Rahway Advocate.]

We learn from a gentleman who arrived in Newark from Trenton yesterday afternoon, that the new locomotive of the N. J. Railroad Co., called the "New-Jersey," traversed the road finely, at the rate of a mile in three or four minutes, notwithstanding the deep snow. A simple machine, invented by L. A. Sykes, Esq., Engineer of this road, placed in advance of the front wheels of the locomotive, operates with complete success as a scraper in removing snow, six or eight inches in depth, with but little interruption. Passengers who left Trenton in the Camden and Amboy Railroad yesterday, an hour in advance of the U. S. Mail line, did not arrive here till this evening.—[Newark Daily Adv., Saturday, Feb. 29th.]

In addition to the above, we are authorized to state, that not a *single trip* has been lost on the above road during the severe part of the winter; and we would further add, that the whole of the work has been done with a single locomotive engine.

This circumstance speaks much for the ingenuity, enterprise, and perseverance of the agents upon the Road, and also does credit to the maker of the engine, Mr. Baldwin, of Philadelphia.

RAILROAD AND CANAL INTELLIGENCE.

NEW-JERSEY.

Much interest is excited throughout the State by the proposed purchase of the Camden and Amboy Railroad and Delaware and Raritan Canal. The subject is now before the Legislature.

MARYLAND.

The Port-Deposite Railroad Company.—This great and important work, in the consummation of which our city is so deeply interested, is now undergoing an investigation before a Committee of the House of Delegates, with the view of determining whether some other route than the one selected by Mr. Latrobe could not have been occupied with equal advantage.

We regret that the House should have deemed the ceremony of such an examination necessary or expedient, because it would seem to us, that the selection of a route must rest, entirely and exclusively, with the Company, independent of any control, except the expressed restrictions of its charter, or the implied prohibitions of law. The credit due to the charters granted by the State, and which it is the interest of every man to maintain, cannot be strengthened and may be seriously impaired abroad, by such Legislative inquiries.

As the Legislature, however, have commenced, we hope they will bring the matter to an early decision, and leave the corporation to enjoy its franchises for its own benefit and for the good, not only of our growing city, but *of the Nation*. Such is our view of the true end and influence of this Railroad, as a link in the great chain of communication between the North and South.

OHIO.

Cincinnati and Charlestown Railroad.—Great rejoicings took place in Cincinnati and the adjoining town when intelligence of the final passage of the Railroad bill reached them.

KENTUCKY.

The Internal Improvement Bill, which was introduced by Mr. Guthrie, and has passed the Senate, provides for a reorganization of the Board of Internal Improvement, by which the services of disinterested and practical men will be secured, and makes the following appropriations:—

For the improvement of the Kentucky river to the Three Forks, by locks and dams,	$200,000
For the improvement of the navigation of Sandy river, and the West Fork thereof,	12,000
For the improvement of the Cumberland river from Laurel Creek to the Tennessee line,	30,000
For the construction of locks and dams in Green and Barren rivers, below Bowling Green,	100,000
For the improvement of the navigation of the Three Forks of Kentucky,	8,000
For slack water navigation on Licking river,	100,000

For the improvement of the navigation of Bayou du Chien, $1,500—for the improvement of the navigation of Panther Creek, $2,500—but one half of said money may, under the direction of the Board of In-

ternal Improvement, be applied to the improvement of two important roads, if deemed expedient,	4,000
For stock in the Lexington and Ohio Railroad Co.—to assist in constructing the line between Louisville and Frankfort,	200,000
	$554,000

In addition to this, the bill places under the direction of the Board of Internal Improvement, all monies arising from the old Bank of Kentucky, and the Bank of the Commonwealth, &c. There can be no doubt, we suppose, of the passage of the bill through the House.

We are unable to say what amount will be appropriated to Turnpike Roads, but suppose it will not fall short of four or five hundred thousand dollars.

MICHIGAN.

Detroit and St. Joseph River Railroad.—At a meeting of the Directors of the Detroit and St. Joseph River Railroad, held at the Bank of Michigan last evening, it was

Resolved, That this Board will put under contract so many miles of the Railroad, as the means furnished by the Stockholders will permit.

Resolved, That if twenty thousand dollars be added by the citizens of Ann Arbor to the sum already subscribed, it will, in the opinion of this Board, be sufficient, with the sum so subscribed, to construct the Road as far west as Ann Arbor.

Resolved, That the Chief Engineer be directed to commence the construction of the Railroad on some section as staked out between Detroit and Dearborn, forthwith.

FAR WEST.

Railroad West of the Mississippi.—The people of St. Louis, Missouri, are about projecting a Railroad from that place to Fayette, upwards of a hundred miles west of the Mississippi. The cost, it is supposed, will not exceed $5000 per mile, and great advantages to the trade of St. Louis are expected to flow from the measure, if adopted.

It is thus that our Western brethren are supplying the links of that great chain of Railroad communication, which before the end of this century, will probably be unbroken between the Atlantic seaboard and the furthest limits of habitation in the West.—The Atlantic and Pacific Railroad will one day be the name of that splendid whole, of which the Baltimore and Ohio Railroad is now one of the parts.

Ashtabula, Warren and East Liverpool Railroad.—We have before us the act to incorporate the Ashtabula, Warren and East Liverpool Railroad Company. The friends of this important work, which is to connect Lake Erie with the Ohio river, by a short, direct and feasible route, will be gratified to learn, by a perusal of the charter, that its provisions are liberal, and such as cannot fail to be satisfactory to capitalists who are desirous of investing their funds in the stock of the Company. We believe this route possesses advantages not equalled, certainly not excelled, by any other between Lake Erie and the Ohio. The whole length of the road is only about 96 miles, passing through a remarkably level country, abounding in materials necessary for the construction of the work. The Southern part of the route, which is decidedly the most difficult, has recently been surveyed by a competent engineer, and found not only practicable, but of easy construction. The following is an extract from the engineer's report, dated at East Liverpool, Columbiana Co., January 16, 1836:

"I procured excellent levelling instruments and all the necessary assistance, and proceeded to level the only Railroad route from the river that is considered eligible within the limits of this county, namely, from East Liverpool by the valley of Carpenter's Run, to the summit between the river and Beaver creek, called Houston's summit; from thence down the valley of Hogle Run, to Frederickstown, near the mouth of the east branch of Beaver, which embraces the whole of the difficult part of the route to the Lake, i. e. that part that is by some considered impracticable.

The final result of said level was more flattering than its greatest friends had anticipated.

I found the fall both ways from the summit to be very uniform, and after deducting 25 feet for a cut, and 45 feet for a bridge at Frederickstown, (both of which can be effected without difficulty,) that the summit can be overcome at 33 feet per mile from the flat at Liverpool, and 31 feet per mile to the creek."

The distance from East Liverpool to Houston's summit is only three and three-fourth miles; and from thence to Frederickstown only four and one-eighth miles. From thence to the Lake ridge the country presents nearly a level surface; and from the Lake to the ridge it has been ascertained that a road may be constructed with an ascent which renders the use of locomotive power on this part of the route perfectly practicable and easy. It will be seen by the advertisement of the Commissioners in another column that books will be opened for subscription for stock on the 31st of March next.

Illinois and Michigan Canal.—The following notice shows that this important work is to be commenced and prosecuted with vigor. Chicago—the city of Chicago, as it will soon be called—will soon feel its influences. We cannot at this distance see how any portion of the State can oppose such a work.

To Contractors.—Notice is hereby given to all persons who may feel disposed to take contracts on the Illinois and Michigan Canal, that the Board of Commissioners have determined to commence that work as early in the spring as circumstances will permit. The Engineers will commence their surveys about the 10th of March, and will have several sections ready for contract by the first of May. It is therefore expected that definite proposals will be received from that date to the first of June. In the mean time the Board invite an early inspection of that part of the route to Chicago, and will afford any information that may be required of them.

All communications will be addressed to "The Board of Commissioners of the Illinois and Michigan Canal, at Chicago."

By order of the Board.

Joel Manning, Secretary.

Jan. 20, 1836.

RAILROAD CONVENTION AT WINDSOR, VT.

Pursuant to public notice, a Convention was held at Windsor, Vt., on Wednesday, the 20th day of January, 1836, for the purpose of taking preliminary measures for the construction of a Railroad through the Valleys of the Connecticut and Passumpsic Rivers to the St. Lawrence; connecting with New-Haven and New-York.

At ten o'clock, A. M., above one hundred and sixty gentlemen, from the States of Connecticut, Massachusetts, New-Hampshire, Vermont, and Canada, assembled and took seats as members of the Convention.

On motion of C. Coolidge, Esq., the Convention proceeded to the election of a President; and Eliphalet Averill, Esq., of Hartford, Ct., was chosen, and took the Chair.

On motion, Mr. Eratus Fairbanks, of St. Johnsbury, Vt., and Mr. John C. Holbrook, of Brattleborough, Vt., were elected Vice Presidents, and took seats as such.

On motion, Messrs. I. W. Hubbard and Jo. D. Hatch, of Windsor, Vt., were appointed Secretaries.

After the appointment of officers, Committees were appointed to report upon,

1st. The *practicability* of constructing the proposed Road.

2d. The resources of the territory falling within the influence of its route.

3d. Its importance in a national point of view—as a portion of a continuous line of communication through the Union.

4th. For procuring charters not yet obtained, and the uniting with companies already incorporated.

5th. To draft resolutions.

6th. For correspondence and publication.

7th. To ascertain the amount of available water power of the Connecticut and its tributaries, from tide water, and also of the streams descending to the St. Lawrence, in the vicinity of the termination of this Road.

From the reports of the Committees under the 1st, 2d, 3d, and 7th resolutions, we make such extracts as we deem of general interest, omitting all such parts of the reports and proceedings as are common to all similar assemblages.

The report, or *address*, or rather appeal, of the Committee under the 6th resolution, to the inhabitants who will be so generally benefitted by the construction of the Road, is so just, so appropriate, and indeed, so

eloquent, and so equally appropriate to many other parts of the country, that we shall endeavor to give it entire in a subsequent number, our columns being, for the present, in consequence of the interruption of the Journal, by the late fire, crowded with interesting subjects long delayed.

C. Coolidge, Esq. submitted the following resolution, which was read and adopted:

Resolved, That Col. James Stevens, of Newport, R. I., Engineer, P. H. Knowlton, of Lower Canada, and Chs. H. Peaslee, Esq., of Concord, N. H., be invited to take seats in the Convention, and assist in the deliberations of the same.

Col. J. Stevens, from the Committee appointed by virtue of the first resolution, made the following report, which was read and accepted:

"The Committee beg leave to report:—

"That, in their opinion, the same is highly practicable; that they have had under consideration the survey of Mr. Hutchinson through the valley of the Connecticut River from Hartford, in Connecticut, to McIndoe's Falls, in Barnet, Vermont, near the mouth of Passumpsic River, a distance of about 220 miles, and the survey of De Witt Clinton, Jr. from thence to Canada line on Lake Memphremagog, a distance of about 65 miles, showing a plan and profile of the country, surveyed for a canal on said route, being the same which is now contemplated for a Railroad. Knowing those gentlemen to be professional engineers of high respectability, your Committee have not hesitated to come to the conclusion, unanimously, that, so far as rise and fall are to be regarded, no unusual obstacle is presented; that, for so great an extent, the route is uncommonly level, and that there is no one point of obstruction in the whole extent that may not be readily overcome, and that without serious expense.

"That, in reference to the soil, in addition to the knowledge possessed by the Committee individvally, they have acquired such information as has been within their reach, and feel confident in affirming that throughout the whole route, the earth is feasible and of easy excavation—and that all the materials for constructing a Railroad are found abundant and cheap upon every part of the line.

"Your Committee report, in reference to the expense of constructing said Railroad, on the most permanent and approved plan, similar to the Boston, Worcester, and Providence Roads, that the costs of superstructure, exclusive of grading, will be eight thousand dollars per mile, for a single track, including the turn-outs; and that the grading, on an average, will not exceed five thousand dollars per mile for a double track, including masonry, bridging, engineering, and all contingent expenses. But, considering the abundance of timber in the vicinity of the route, suitable for constructing a Railroad, and the facility of obtaining the same, other plans equally practicable and far less expensive, might be advantageously adopted. The superstructure of the Road with timber, without rubble-stone, might be constructed for six thousand dollars per mile less than the estimates of a Road similar to the Worcester and Providence Roads.

"The estimated expense of a Road, the whole distance, constructed upon the plan first mentioned, would amount to $3,705,000
Upon the last mentioned plan, 1,995,000

Making a saving in expense, of $1,710,000

"It is well known that the surveys of Messrs. Hutchinson and Clinton were made for a then contemplated Canal, and of necessity must have been confined to the streams; but in a survey for a Railroad it is highly probable to your Committee that the route will be varied in many essential particulars.

"Your Committee further report, from the best information they have been able to obtain, that the route from the line of Canada to St. Johns, a distance of about seventy miles, intersecting the Champlain and St. Lawrence Railroad, is highly practicable, and through a level and fertile country, and that from the well known enterprise of the inhabitants of the eastern townships in the Province of Lower Canada, should the now contemplated Railroad be extended to the Province line, a communication would soon be opened from that *terminus* to Montreal, and that the expense of constructing the same will not exceed the foregoing estimate; and they further report, that there is another route in contemplation from the Province line through the valley of the St. Francis to the St. Lawrence, in the direction of Quebec, which is represented to be equally practicable, and affording equal facilities.

JAMES STEVENS,
for the Committee."

Charles M. Emerson, from the Committee raised under the second resolution, made the following report, and the same was read and accepted.

"The Committee beg leave to report:—

"That, from the nature and magnitude of the subject, the materials to be combined, and the great variety and extent of information necessary to do it justice, they found it impossible to furnish, in the short time allowed them, a statemant which would at once comprehend and elucidate the objects of the reference. To form an estimate of the vast and inexhaustible resources of the valley of the Connecticut, its whole surface should be attentively surveyed; full abstracts should be returned from every town, containing the amount of articles purchased for home consumption, and sold for consumption elsewhere; its capacities for improvement and production should be ascertained; its mineral wealth should at least be partially explored; its streams should be accurately guaged, and the power of its waters examined; while its natural advantages, unrivalled in any other section of the country, should be presented and shown to be available. Such an estimate must be the result of patient and industrious inquiry, and, with its details, would fill a volume. Your Committee, therefore, could do no more than approach the threshhold of the duties assigned them, and point out the more obvious features of the route.

"The enterprise contemplated, is, the opening a communication for passengers and freight from the cities of New-York, New-Haven, and Hartford, and collaterally from Boston, with the cities of Montreal and Quebec; creating, through the valleys of the Connecticut and Passumpsic Rivers, a pleasant, convenient and expeditious thoroughfare between the cities of the Atlantic and the St. Lawrence. It contemplates making easily accessible an extensive section of country, abounding in resources for agricultural and manufacturing operations, but whose remote situation from the seaboard markets now render those resources in a degree unavailable. The face of the country receding from the rivers is hilly, but not mountainous—the soil is rich and durable, and as it respects the middle and northern parts, the heights are capable of cultivation quite to their summits. In many points the Connecticut River affords water power in abundance, while its tributaries, almost without exception, are available for hydraulic purposes, at short distances, through nearly the whole course, furnishing sites for long and continuous lines of manufacturing establishments. And perhaps it would not be hazardous to predict, that should the proposed Railroad be completed, the middle and northern sections of the route would, at no remote period, become the great manufacturing mart of this continent.

"It may be here added, that the country to be traversed by the Road abounds in suitable materials for the construction of a Railroad, such as cedar, tamarac, pine, granite, &c., while in the northern part of Vermont, and near the contemplated route, inexhaustible veins of iron ore have been discovered, and companies of heavy capitalists have already commenced the manufacture of iron on an extensive scale.

"It is evident that one great source of revenue to stockholders in the proposed Railroad, must be the transportation of freight. Of the amount of produce and merchandise, which would find their way from the valley itself and the avenues leading thereto, over the Road, the Committee could furnish no satisfactory or accurate estimate, as they had no data before them by which they could be governed with much certainty; but from the known character and physical advantages of the valley, the vast business already transacted therein, the numerous manufactories in operation, and the great quantity of produce exported annually, they feel warranted in giving it as their opinion, that the Road would be well supported by tolls receivable from freight alone, exclusive of the tolls to be derived from passengers. From a report submitted to the subscribers for procuring a survey of the Western Railroad, extending from Worcester to the Hudson River, prepared by their engineer after a long and critical investigation, it appears that the number of inhabitants within the territory to be affected by said road, is not far from 220,000—the amount of freight which in all probability would be transported over the Road would exceed 148,000 tons—while the tolls receivable from passengers, per annum, would exceed $170,000. The present population of the district falling within the influence of our contemplated

Road, will not fall much short of 500,000 inhabitants. In 1830, the three counties in Massachusetts bordering on the river contained 91,394 inhabitants—the four western counties of New-Hampshire 93,755—and the six eastern counties of Vermont, 135,586. The amount of business transacted in the district alluded to, is unquestionably as great in proportion to the number of inhabitants, as that transacted in the territory over which the route for the Western Railroad was surveyed, and taking the above report as a basis, from which some estimate may be made, and giving the same proportion of tonnage to the number of inhabitants within the influence of the contemplated route, there can scarcely be less than 400,000 tons to be transported over the Road. Full returns from a few towns, and partial returns from some others, fully sanction the above estimate, which your Committee believe to be far below the whole truth.

"Much statistical information was communicated by members of the Convention to the Committee, which they had not time to incorporate into a report, and indeed they found it impracticable to do so with reference to any general result; but they selected the following as affording some indication of what may be expected from the entire region. The annual exports and imports from the town of Derby, Vt., containing 1400 inhabitants, and bordering on Canada line, exceed 200 tons—from Barnet, with about 1800 inhabitants, over 370 tons—from Coventry, Vt., with about 800 inhabitants, 166 tons—from Brownington, Vt., with 500 inhabitants, about 60 tons—from Barton, Vt., with 1000 inhabitants, 112 tons—from the manufacturing village of Bradford, Vt., 1500 tons—from Lyndon, Vt., with 1800 inhabitants, 300 tons—from Glover, Vt., with 1200 inhabitants, 120—tons—from two establishments in St. Johnsbury, Vt., whose operations are connected, 500 tons—from one in Brattleborough, 250 tons, and from one in Stratford, Vt., the copperas works, 2200 tons. It is proper to remark, that no returns were received from the large towns on the river, and that the amount of tons exported and imported from and to the same would doubtless exceed the foregoing average. The expenses of transportation to and from the western counties of Vermont, will average at least $20 per ton, and the expense per ton, from Hartford, Ct., to Springfield, Mass., a distance of only 26 miles, is two dollars per ton. Some idea, therefore, can be formed from the above facts, of one source of income from the Road.

"In regard to the number of passengers who would probably take this route, your Committee had no facts on which an estimate could be founded, but when we consider, that the population of the district is already great, and fast increasing, that its connection, in a business point of view, with other sections of country is intimate, that its various, grand, and picturesque scenery, and the beauties of the route, would be inducements to parties travelling for health or pleasure, that the water communication with Montreal and Quebec is sealed up five months in the year, rendering the thoroughfare the easiest and most direct to and from the St. Lawrence; no doubts could be entertained, that another large source of revenue would be derived from passengers.

"C. M. Emerson, for Committee."

George T. Davis, from the Committee on the 3d resolution, made the following report, which was read and accepted.

The Committee beg leave to report:—

"The brief space allowed to your Committee for the making of their report, will prevent them from giving more than a general view of the subject committed to them. A great deal, indeed, of the evidence which has been or will be presented to the meeting by other Committees, will apply to this subject also. The territory which the proposed Road will travese, and whose inhabitants will be directly and largely benefitted by it, is three hundred miles in extent; it is, beyond comparison, the most fertile district in New-England; it possesses water power, (furnished by the magnificent river from which it is named, and by the tributaries of that river,) enough, it is believed, to drive all the looms now in operation in the Union; it supports a population equal to one sixteenth of the entire population of the United States; and it is capable of supporting ten times that number, if the facilities which have been given by nature shall be improved and rendered available by the art and enterprise of man. The welfare of so large a population—the development of such great resources, cannot be an unworthy object of protection to a government which seeks, by reasonable attention to the claims of each section, to promote the common prosperity of the whole.

"But there are special as well as general reasons which, in the opinion of your Committee, make this enterprise a matter of peculiar interest to the General Government. This Road will run straight from the seaboard to the frontier of a neighboring government. Should we continue at peace with that government, a traffic and intercourse of the most profitable kind, with the subjects of that government, will receive a mighty impulse from this work, and will have a tendency to secure, by a strong additional bond of mutual interest and intimacy, the present friendly relations between the two countries. This remark will apply with still greater force to the effect which this and other similar works, of which this is but a continuation, will have on the relations of the several States of our Union. Composed, as that Union is, of many sovereignties, spread over so wide an extent of country, and embodying many contending interests, there is much reason why every well-wisher to his country should hail the progress of improvements which, by breaking down the barriers to sectional intercourse, diminish the operation of sectional animosity or prejudice. And your Committee cannot but hope that this enterprise,—though its direct object is merely to meet the wants of the inhabitants of this valley, to increase their intercourse, and to develope their resources,—will, nevertheless, receive aid from the General Government, proportionate to the benefits which, if successful, it is likely to afford to the Union at large.

"All which is submitted per order.

"Geo. T. Davis, for Committee."

Thursday, Jan. 21.

F. E. Phelps, from the Special Committee appointed to ascertain and report the amount of available water-power within the range of the proposed Road, submitted the following report, which was read and accepted:

"Your Committee, to whom was referred the subject of water-power within the Valley of Connecticut River and its tributary streams, as also the water-power within the valleys of the streams running north from the head waters of Passumpsic River, with instructions to report generally as to the probable amount of said water-power, having given to the subject such consideration as the limited time would allow, respectfully report:—

"That, in estimating the water-power, your Committee have based the estimates upon the quantity of water running in the rivers and streams at low water: and inasmuch as the quantity of water passing over the falls upon Connecticut River at low water below Bellows Falls, is considerably greater than the quantity passing over the falls located above Bellows Falls, the average of the whole is set somewhat higher than the quantity passing at that place. It will also be perceived that the surplus quantity of water running at periods of high water, as also the quantity of water running in the streams for two or three months in the spring of the year, are not taken into the account, although in many instances a large amount of power derived from the spring and other high water, is not only available for many purposes, but actually used in the manufacture of lumber and other branches of business requiring only an occasional power.

"For the purpose of bringing the estimate into a convenient shape, and placing it in such a light as to be readily understood, and easily compared with other power of a similar kind, your Committee have estimated the quantity of water by the number of cotton mills it is capable of operating, estimating each cotton mill at 4,000 spindles.

"From the level of the water in the pond above the dam at McIndoe's Falls to the level of tide-water at low tide opposite the city of Hartford, the whole fall in Connecticut River is 449 feet 6 inches—of this 449 feet, 270 feet is estimated at the dams at McIndoe's Falls, Dodge's Falls, White River Falls, Quechee Falls, Bellows Falls, Miller's Falls, South Hadley Falls, and Enfield Falls, and the remaining 179 feet 6 inches is distributed in unequal proportions along the whole extent of the river between the several dams.

"Without taking into consideration any proportion of the 179 feet 6 inches, a considerable part of which could be rendered available by the construction of dams, the Committee have founded their estimates upon the 270 feet fall at the several dams. Supposing the fall required for each set of manufactories to be 15 feet, predicating the estimates upon the quantity of water used at Lowell, and averaging the quantity of

water in the river, your Committee are of the opinion that each fall of 15 feet would furnish sufficient water to operate 20 manufactories or cotton mills of 4,000 spindles each. If this estimate is correct, the available water-power from and including McIndoe's Falls to tide-water, would be sufficient to operate 360 cotton mills—or one million four hundred and forty thousand spindles.

"In the amount of available power in the valleys of the tributary streams, your Committee found considerable difficulty in coming at any satisfactory result. This difficulty arose from the want of correct information as to the fall upon the several streams, and also from want of information as to the quantity of water in each stream in times of drought. After giving to the subject such attention and making such examination as the limited time and means would allow, your Committee come to the conclusion that the water in the Farmington, Westfield, Chickopee, Manhan, Deerfield, Miller's, Ashuelot, West, Cold, Saxon, Williams, Black, Little Sugar, Sugar, Mascom, Quechee, White, Ompompanoosuc, Waits, Wells, Ammonoosuc, and Passumpsic Rivers, together with Connecticut River above McIndoe's Falls, and including about fifty brooks and mill streams, (taking into consideration the great amount of fall in many of the principal of these streams,) would yield a power sufficient to operate 720 cotton mills or 2,880,000 spindles.

"The estimate of the water-power in the valleys of the streams running north from the head waters of the Passumpsic and emptying into Lake Memphremagog, includes the Barton, Black, Willoughby, and Clyde Rivers. From the information furnished by gentlemen living in the vicinity, of those rivers, and well acquainted with the falls in each, the Committee estimated the power as sufficient to operate 120 cotmills or 480,000 spindles.

"From the above estimates it appears that the available power in the valleys of the Connecticut River and its tributaries, and in the valleys of the streams running into Lake Memphremagog, when measured by the rule laid down above, viz. by the number of cotton mills or spindles it is capable of operating, is as follows:

	Cotton mills.	Spindles.
Connecticut River from McIndoe's Falls to tide water at Hartford, Conn.,	360	1,440,000
Tributary streams, including the increased fall of the stream,	720	2,880,000
The rivers running into Lake Memphremagog,	120	480,000
Making a total of	1,200	4,800,000

"Your Committee are aware of the enormous amount of power which this estimate presents, and are fully sensible that it will occasion surprise in the minds of those who have not examined the subject; but extravagant as it may appear, your Committee are unanimously of the opinion that these estimates are much below rather than any above the actual power.

"To give some idea of the amount of freight which would be thrown upon the Railroad in case this power was used for manufacturing purposes, your Committee would observe that a cotton mill of 4,000 spindles will manufacture about 7500 lbs. of cloth per week. One hundred pounds of cloth requires, from New-Orleans cotton, 112 lbs. of raw cotton equal to 3¾ tons per week—making the import and export from the cotton mill 7½ tons per week, or 390 tons per year. 1200 cotton mills, according to this estimate, would yield 468,000 tons of freight, which estimated at three dollars per ton, would amount to $1,404,000—or more than 25 per cent. interest on five millions of dollars.

"All which is respectfully submitted.

"FRANCIS E. PHELPS,
for the Committee."

After the different reports were made and adopted, the following important resolution was offered by H. Averill, Esq., and adopted:

"Resolved, That the Committee of Correspondence be instructed to take immediate measures to secure the services of a competent engineer to survey the route for a Railroad from Hartford, Ct., to the north line of the State of Vermont, through the valleys of the Connecticut and Passumpsic."

We cannot, however, permit this opportunity to pass without expressing our highest satisfaction with the proceedings of the Convention in relation to this most important Road, or as we are in the habit of designating every new Road already or about to be undertaken—"*link in the gran dchain.*" There are in reality but few routes *along* which the inhabitants would be more benefitted than that through the valley of the Connecticut. It is in truth the garden of New-England—and it is inhabited by as hardy, as honest, as industrious, and as intelligent a population as can be found *elsewhere*. Yes, *we challenge the world to produce its parallel!* Why, then, have they so long neglected to improve their own beautiful valley—and thereby retained their sons and daughters around them, to cheer their declining years, and to enjoy the pleasure of improving their native hills and beautiful valleys? Simply, we answer, beacause they are an hardy, and prudent people, who grow wealthy rather by industry than by speculation—and they have therefore been content with the ordinary facilities for transacting business. Times, however, and things have changed, wonderfully changed, within a few years. And the habits and necessities—no, *not necessities*, but *desires*, of the people must also change. *Four* and *five* miles an hour will not answer now a days—nor one or two tons for a load of merchandise, or produce—by no means—it must be *forty* to *one hundred* tons at the rate of ten to fifteen miles per hour, to satisfy those who believe in the "march of mind" of the present day!—Must, did I say? Yes, *must*, and we know of no section of the country in which it may—nay, *will*, be accompanied more readily, or more certainly, than by the people of the Connecticut Valley?

We were surprised and highly gratified by the facts stated in the report of the Committee to ascertain the amount of available water power of the Connecticut, its tributaries and the streams running into Lake Memphremagog.

Cradled, as we were, in the *upper* valley of the Connecticut, and having spent many years along its banks, we supposed we knew something of its resources. We were not, however, aware of the extent of power, *unused* and useless power—useless *only* for want of easy and cheap access to it—which it could boast. Our lack of information, however, was from a want of investigation, as we can, on reflection, well believe—and not from the absence of data to arrive at the truth. And we are the more strongly impressed with the importance of this work, and the necessity of early, efficient, and untiring efforts to insure early construction.

In relation to the amount of business which the country will furnish, we do not deem it necessary to say a word, save that there cannot be a doubt—not a *single doubt*, but that it will, immediately on its completion, pay an income of 10 per cent. at least, and this will be greatly increased in five years, at fair rates of toll. This, however, is not its most important feature—this will not be its greatest value; as, on that day on which a locomotive shall pass its entire length, from *tide water* to *Canada line*, and, *of course, to Montreal*,—on that day, we say, every man's property within six miles of its route, will be worth 25 per cent. more than it is *this* day, and in truth and conscience we may say *forty to fifty per cent.*—an increase which would make *three* such roads. Go on, then, say we—go *ahead*—HESITATE NOT.

In the following letter from the Evening Star will be found a very satisfactory account of the Boston and Lowell Railroad. It will be perceived that in the construction of this work no expense has been spared to insure permanency and solidity.

BOSTON AND LOWELL RAILROAD.

Extract from a letter dated Boston, Feb. 20, to a gentleman in this city.

"I will now proceed to answer your several inquiries relative to the Lowell Railroad, its location, its construction, and the prospect with regard to the value of the stock, &c.

At an early period, after it began to be believed that a Railroad would afford immense facilities for travelling and transpor-

tation, the idea of constructing such a road from Boston to Lowell at once occurred to every person, who was acquainted with the localities, and had any knowledge of the business which would be carried on between the two places. In the year 1830 a favorable charter was obtained from the Legislature. The stock was taken up, and the corporation was organized. The corporation was so fortunate as to secure the services of Patrick T. Jackson, Esq., who was chosen one of the Directors and appointed sole agent for the construction of the road. Surveys were made of every possible route between Boston and Lowell, and careful plans were drawn. Particular surveys were made with reference to the point where the road should enter the city of Boston. After much examination, and a full consideration of all matters which could bear on the question, a definitive location was made, and it is admitted by all, I believe, that the best route was adopted. The agent well knew the importance of having the assistance of an engineer, who possessed not only science, but practical wisdom and experience, and such an one he employed. The agent and engineer at all times acted together with perfect harmony, devoting their time, their *whole time*, and *undivided* attention to the great work. The most accurate calculations were made, the most careful inquiries were instituted in England and in this country as to the best mode of construction. Every matter was fully examined and considered in order to ascertain the exact truth. Every part of the work was constantly watched, and personally inspected. The agent resolved that a Railroad should be built in the best place, on the most solid foundation, and of the most durable materials, and I think he has accomplished his object.

The length of the road from the sea-wall in Boston to the depot on Merrimac street in Lowell, is a fraction short of twenty-six miles. The line is nearly straight. There is but one curve of a less radius than three thousand feet. There are but two points where the ascent is greater than at the rate of ten feet in a mile, and the summit level or highest point above the tide water at Boston is one hundred and eighteen feet only, and that occurs at a place twenty-one miles distant from the city. A fine wide road-bed is graded on the whole line. In no place is the width less than twenty-six feet *in the clear*, and that too on a line ten inches below the top of the rail. There are comparatively few deep cuts, and in all cases the inclination or slope of the bank is at an angle of about 33 degrees only, and if it is found in any place that the earth or gravel on the slopes slides or rolls down, a further removal from the slopes is made instead of placing heavy and expensive walls at the base of the bank, as has been done with very bad calculation and economy on some Railroads, especially when these walls are placed near the Railroad track. At some few points a low wall has been built at the foot of the slope, but in all cases the same is placed at a distance of five feet at least from the track of the road. There is, therefore, all the way, room enough. There is no contraction. There is ample space for the snow to be deposited, when removed from the track, and there is sufficient room to move and work in case of accident. Large drains have been made by which the water is carried off, and as soon as the drain on the side of the second track is completed, the whole road will be thoroughly drained and kept perfectly dry. The track of the Railway now in use is laid, except for a short distance, on a trench-wall, sunk 2½ to 4 feet below the surface, according to the character of the soil, and 2¼ feet thick. On these walls rest stone blocks and binders, generally six blocks and two binders to each length of rail, (being five yards,) and the rails are fastened to them.

In a recent report, made to the directors of this road by the agent, he makes the following remarks, to wit: "It is asserted by some that wood is better than stone, even at the same cost. The reason assigned is, that wood being elastic, will yield to the pressure of the carriages passing over it, and cause the motion of them to be more easy. It will be admitted that the more level and straight the lines of the Railroad are, the better it is. It must, therefore, be true, that the supports should be as solid and unyielding as possible, in order that these lines may be preserved. The experience gained on the Lowell road has confirmed the agent in the opinion, that where the rails are laid on a firm foundation, with stone supports placed so near as to prevent any bending of the rail between them, so that there will be no yielding, no elasticity, there will be less jar and irregularity in the motion of the engines and cars, fewer accidents, and of course less wear and tear in the carriages and on the road, than there would be if rails were laid on a foundation and supports which, being elastic, would yield to the pressure of the weight passing over them." Much care has been taken to remove all clay from the road, and there is very little, if any, danger of the rails being in any degree moved or affected by the frost. The rails are placed at a proper height, and it will rarely happen that the snow will fall in such quantities that it cannot be easily brushed off by the broom before the engine, or removed by the snow plough, so as not to interfere with the rail. The flanges are never in danger of striking the frozen earth, and very rarely of touching any ice near the rail. Notwithstanding the unusual severity of this winter, the cars have run with great regularity. They have been interrupted by the snow but a very few times. The whole distance is run with great uniformity in about an hour and a quarter. It has been run in an hour.

Great pains have been taken to prevent any thing, which may obstruct or annoy, from entering on, or crossing the Railroad. In all cases, where it was necessary to have any crossing from one part of a farm to another, the same has been carried over or under the Railroad; and this course has also been taken on the public highways with the exception of a very few places, and at those points gates have been erected and men are stationed to open and shut them, when the engines and cars arrive and pass. Sufficient fences are built on each side of the road throughout the whole distance: so that the entire road is made perfectly secure from all external cause of obstruction or annoyance.

The second track has been commenced, and the work will be prosecuted with all convenient despatch. On some other Railroads, as soon as a small piece was completed, the cars were set in motion, which course, though it served to amuse and astonish at the moment, yet interfered with the work, and ultimately became a source of great additional expense and trouble. But the agent of the Lowell road kept on the even tenor of his way, and when one entire track was completed the whole distance, and sufficient engines and cars to accommodate the public were obtained, he opened the road for passengers, and as soon as all things were ready, and the tracks were laid at Lowell to the several factories, the transportation of merchandise was commenced.

The annual expense of the Lowell road will be less than has been anticipated. The *wear* and *tear* of the road, and of the engines and cars will be comparatively small. During the last summer, two engines passed over the road, each three times every day, and did not lose a single trip. There is hardly a limit to the number of cars, freighted with passengers or merchandise, which may be drawn with a single engine over this road. I am informed that one engine will carry from fifty to one hundred tons with ease.

There is a tract of land belonging to the corporation, containing about twelve acres, situated on the Cambridge side of Charles river, a small part of which is used for a depot for merchandise and for buildings to accommodate cars and engines, and the residue is to be sold. There is also a tract on the Boston side, appropriated for all the wants of the corporation. To both of these tracts, vessels may come up and load and unload. A five range of brick warehouses are now building by another corporation on each side of the Railroad track at the terminus in Boston, with suitable accommodations for lowering and hoisting goods, to and from the merchandise cars. Great facilities will be afforded for the transportation of merchandise to and from the Lowell factories.

Another advantage which this road has at present over any other, certainly in this part of the country, I will now mention. The sagacious founders of the town of Lowell, who acted under a certain corporate name, having secured all the water power created by the falls on the Merrimac river, at this place, and having purchased all the land on which factories could be built, soon established an extensive machine shop, and took much pains to bring together a great number of skilful artificers. Whenever they concluded to sell sufficient water power for one or more factories to a new corporation, they sold the land also on which to build the same, and contracted to erect the buildings and to furnish all the requisite machinery. At this machine shop has been built all the machinery for the several factories at Lowell, and for many other factories about the country. Here, too, all the

repairs required by the machinery at any of the establishments are made,—and all this work is furnished at short notice, and according to a proper scale of prices established by the Directors, being such as shall afford a reasonable and fair profit only to the concern.

This establishment, of which Major Whistler now has the chief direction, under its wise regulations is of vast importance to all the factories at Lowell. Another department has lately been added, viz. for building locomotive engines, cars for passengers and merchandise, and for doing the repairs on the same.

First rate locomotives have already been built here, superior, as I am assured from good authority, to any which can be imported from England. Several tenders and cars have also been built, and if any repairs are required on engines, tenders or cars, they are run directly into the shop, where each and every part of the same can be easily inspected, and all defects or injuries are detected and repaired; and all these things are accomplished at reasonable prices. The Railroad stands in the same relation to the machine shop that the factories do. The Railroad corporation has all the advantages of this excellent establishment without the risk, expense, outlay of capital, or trouble, which would attend the setting up of a machine shop for the accommodation of the Railroad only. I consider this machine shop as adding several per cent. to the value of the capital stock of this Railroad.

This stock yields at the beginning about eight per cent. per annum. The capital is fifteen hundred thousand dollars, which is fully adequate for completing the Railroad with the second track, and procuring all necessary engines, tenders, cars, fixtures, &c., and the income must certainly increase. I think it more certain than Bank Stock. It is owned mostly by sagacious capitalists. Those who are most familiar with the history of the road, its location, its mode of construction, its capabilities and prospects of income, have become owners of large quantities of the stock. I see no reason why the result of this enterprise should not be equal to that of the Liverpool and Manchester Railroad."

REPORT OF THE CITY DIRECTOR OF THE BALTIMORE AND SUSQUEHANNA RAILROAD COMPANY.

To the President of the First Branch of the City Council of Baltimore:

Sir,—In compliance with an order of the First Branch in the following words, this report is respectfully submitted.

Ordered, that the Director on the part of the city in the Baltimore and Susquehanna Railroad Company report to this Branch, the relative position of that Road to the public improvement, in the State of Pennsylvania, and what advantage, if any, the position of said Road occupies in relation to the western waters, by reason of its connection with the Pennsylvania works and any other projected communication with the western waters.

From my recent connection with the Road, it will be readily perceived, the very great disadvantages I labor under in making up an opinion, even satisfactory to myself, much less such an one as will be of much utility or benefit to the Council.

In regard to the first part of your order, respecting the relative position of the Road to the Pennsylvania public improvements, I have been able, as the map accompanying will show, to furnish the information desired. I have also submitted a table from No. 1 to 8, showing the distances of the different routes contemplated, both by Railroad and Canal, from the Maryland waters to the Ohio River; also the distance from Philadelphia by the Pennsylvania routes to the Ohio River.

You will at once perceive, by casting your eye over the map by the very great advantages that accrue to Baltimore by the Susquehanna Railroad, independent of those that will necessarily follow by a connection with the Pennsylvania works of Internal Improvements already completed. Although not embraced in your order, I may be permitted to call your attention to the fact, that this Road is destined, ere long, to open as rich a harvest to the enterprising people of Baltimore, as that contemplated by a connection with the Pennsylvania works, for besides the improved communication which Pennsylvania has formed directly with the west, she has opened other channels along the Susquehanna Valley, which, by no very extensive prolongation, will form for her, connections with the Erie Canal, and through it with the great northern lakes. From Williamsport, which is on the west branch of the Susquehanna, and on the line of her State improvements to Elmira or New Town, in the State of New-York, the country has been surveyed by Major Bache, United States Topographical Engineer, who, in his report made to Congress, states that a Railroad from Williamsport to Elmira, may be executed without having to contend with any very extraordinary difficulties, or those requiring expenditures beyond other works of the same description. Elmira is at the head of the Chemung Canal, through which it has a communication with Seneca Lake, which is connected by a short Canal (20 miles,) with the Erie Canal. The same authority goes on to state, that it is in contemplation to connect the Internal Improvements of New-York and Pennsylvania, by uniting the Pnnsylvania Canal, at Williamsport, with the Chemung Canal at Elmira. When this takes place, a choice of markets will at once be open to the produets of this wide extended and fertile district of country. Baltimore will then be placed in a situation to compete with her powerful neighbors, New-York and Philadelphia, for the immense trade that must necesrarily flow through this channel.

Although New-York can boast of her more ready access, at al seasons of the year, to the ocean than Baltimore, yet she would have to contend with a difference of distance of one hundred and ten miles in favor of Baltimore, and should the Railroad reach the point contemplated on the Susquehanna, it will be a difference of about thirty miles in favor of Baltimore over Philadelphia. In addition to that, we afford a whole line of Railroad from Harrisburg to Baltimore, while a portion of theirs will be by Canal. What a vast field is here presented to our enterprising merchants! for it is not only the trade of the rich and fertile country bordering on the Susquehanna, she has by this Road opened to her,—although that is a prize worth contending for,—when we consider the vast body of rich flats on the Susquehanna, when its various branches pass the Genesee country, and the ease with which the produce of the Genesee River can be brought to the navigable part of the Canestoe, it will appear, as a writer says, treating of the country, "that the quantity of Hemp alone which may be collected at Tioga or Painted Post, will be incalculable."

The flats on the Genesee and Canoscrago creeks alone, cannot be estimated at less than eightly miles in length, and two in breadth, forming a body of land of about eighty thousand acres, and every acre about eighteen feet deep of black mould, where one hundred bushels of corn has been raised to the acre from time immemorial.

But there is still a more valuable prize open to Baltimore by this Road. Those who have not made it their business to inform themselves of the advantages of this route to the far west, can have no conception of the rich harvest that is opening to them. Let the eye for a moment trace on the map a wide and extended country embracing whole States and territories, and those filling up with a rapidity unparalleled, composed, as that population is, too, of the hardy, and enterprising yeomanry of our country; washed, as this fertile country is, by the mighty inland seas, Lakes Superior, Huron, Michigan and Erie. Illinois is also awakening to her best interest, by opening a communication, either by Canal or Railroad, from the head of navigation of the Illinois River to Lake Michigan, Congress having granted every alternate section of the land on the line of the contemplated improvement for that purpose. Nature, indeed, has nearly herself completed the work, for one of the head streams of the Illinois rises within ten miles of Lake Michigan, and boats of five tons burthen have already, at certain seasons of the year, passed through it to the lake.

This river falls into the Mississippi at the town of Alton, and passes through the largest body of rich land of equal extent in the known world, and I think the prediction not extravagant that the Illinois will bear upon its bosom, one day, fully as large an amount of the valuable products of the rich valley of the Mississippi, as the noble and beautiful river that gives name to one of the States of this happy Union, the Ohio. It also opens to us a direct communication, by Railroad, and Canal, and steamboats, with New-Orleans. If Baltimore is only true to herself, a large portion of the trade of this extensive country may be made to flow into her bosom; for you will observe that the natural channel for it to take is through the lakes; and the Falls of Niagara offering insurmountable obstacles to its further progress by the lakes, it is compelled to seek the Erie Canal, and then the competition to secure it must be between New-York, Philadelphia, and Baltimore. That we may put in a claim for a large portion of it has before been fully shown, arising

from the advantages of our local relations to this country, compared with those of the two other cities mentioned.

What a field is here opened to Baltimore, what a stimulant to arouse her to exertion, to know that she is placed in a situation to enable her to contend, and that successfully too, with her proud rival, New-York, for this valuable trade.

Recurring again to your orders, you will observe on the map presented, as well as the table accompanying it, that all the advantages of the main line of Internal Improvements in Pennsylvania, resulting to Philadelphia, must, in a greater degree, operate in favor of Baltimore, so that for all the purposes of intercourse with the west, Baltimore is more favorably located than either of her rival sisters, Philadelphia and New-York; and what is still better, all those advantages are comparatively of small cost to us, and such is our connection with the improvements of Pennsylvania and New-York, that it will be impossible for them to make any improvements affording greater facilities for either of their commercial emporiums to the west, without Baltimore having the full advantage of them, and that, too, without the expenditure of a single additional dollar. The Susquehanna Railroad Company have already funds in hand sufficient to complete the Road to its destined point.

Now, whether from the fact of this Road placing us on an equal footing with Philadelphia and New-York, it would not be better for us to husband up our resources, to exert all our energies in supplying our market with an assortment of merchandise equal to our two rivals in trade, and to be able to offer the same indulgence to our customers; for unless you can offer the same inducements to merchants from the west and south to make their selections of you, it will be in vain; all your attempts to secure their custom, though you offer them a road to the west through every avenue of your city, for they will only use them for travel and for the conveying of merchandise purchased in other cities. And indeed, who is there among us that has not witnessed with regret the large amount annually of merchandise passing through our city, belonging to men too who first gave us their preference, but finding the assortment incomplete, went to the north, made their purchases, and sent their goods back by your own doors to the west.

Will this course of things not continue even if you should make fifty Railroads and Canals to the west, unless you offer such advantages as to make it an object with them to stop with you? unless you do this, you may purchase their produce and New-York and Philadelphia will get the money, you may buy, and they will sell, and I think it will require no very great stretch of reasoning to show which will be the gainer or loser by such a trade. No city, I believe, could sustain itself long by buying alone. As you are furnished with a map and table of distances by the different routes to the west, I must leave it to the wisdom of the Councils to decide the value of each, either, or all the contemplated works of Internal Improvement to the Ohio River.

S. Brady.

P. S. The Susquehanna Railroad, if nothing turns up to prevent, will be open for travel to York in the course of twelve months.

Route to the Ohio River.

No. 1.

	Miles.
Baltimore to Harper's Ferry, Railroad,	80,500
Harper's Ferry to Cumberland, Railroad,	125,000
Cumberland to Youghagenny River, Railroad,	63,700
Youghagenny River to Brownsville, Railroad,	48,300
Brownsville to Wheeling, Railroad,	70,250
Total distance from Baltimore to Wheeling, Railroad,	387,750

No. 2.

Baltimore to Brownsville, Railroad, as above,	317,50
Brownsville to Pittsburg,	50,00
Total distance from Baltimore to Pittsburg,	367,50

No. 2½.

Baltimore to Harper's Ferry, Railroad,	80,50
Harper's Ferry to Cumberland, Railroad,	125,00
Cumberland to Youghagenny River, by Railroad, with a grade across the mountains, not exceeding 50 feet to the mile,	76,70
Youghagenny River to Brownsville,	48,30
Brownsville to Wheeling,	70,25
	400,75

No. 2¾.

Baltimore to Brownsville, as above	330,50
Brownsville to Pittsburg,	50,00
	380,00

No. 3.

Baltimore to York, Railroad,	57,00
York to Columbia, do.	12,00
Columbia to Holidaysburgh, Canal,	171,75
Holidaysburgh to Johnstown Portage, Railroad,	36,75
Johnstown to Pittsburg,	104,00
Total distance from Baltimore to Pittsburg,	381,50

No. 4.

Baltimore to York, Railway,	57,00
York to Middletown, do.	17,50
Middletown to Hollidaysburg, Canal,	154,50
Hollidaysburgh to Johnstown Portage, Railroad,	36,75
Johnstown to Pittsburg, Canal,	104,00
Total distance from Baltimore to Pittsburg,	369,75

No. 5.

Philadelphia to Columbia, Railway,	81,75
Columbia to Hollidaysburgh, Canal,	171,75
Hollidaysburgh to Johnstown, Railroad,	36,75
Johnstown to Pittsburg, Canal,	104,00
Total distance from Philadelphia to Pittsburg,	394,24

No. 6.

Georgetown to Harper's Ferry, Canal,	61,06
Harper's Ferry to Cumberland, Canal,	125,00
Cumberland to Youghagenny run, Railroad,	63,80
Youghagenny run to Brownsville, Canal,	70,25
Total distance from Georgetown to Wheeling,	368,25

No. 7.

Georgetown to Brownsville, as above,	298,00
Brownsville to Pittsburg, Railroad,	50,00
Total distance from Georgetown to Pittsburg,	348,00

No. 8.

Richmond to Covington, Canal and Railroad,	212,00
Covington to Ohio River, at mouth of Kenhawa,	218,00
Total distance from Richmond to Ohio River,	430,00

In the following Report we have only selected such items of repair as occur in positions worthy of note. The repairs in general are,—

Docking, to protect the banks from wash.

Removal of deposits and deepening the bed of the Canal.

Removing slides, and protecting slopes in deep cuts.

Gravelling and raising tow paths.

Substituting stone for wood in locks, &c.

ANNUAL REPORT OF THE CANAL COMMISSIONERS, TO THE LEGISLATURE OF THE STATE OF NEW-YORK.

The Canal Commissioners, pursuant to chapter nine, title nine, article second, of the first part of the Revised Statutes, respectfully submit their

ANNUAL REPORT.

The navigation on the Canals was commenced on the fifteenth of April, and continued, with but little interruption, until the latter part of November. The last winter was uncommonly cold, and the frost remained in the ground later in the spring than usual, making the repairs to the Canals difficult and expensive, compared with other seasons. The Canals, however, were put in a condition to accommodate the great

and increasing business upon them, and so continued until they were closed by ice.—The weather, in the month of November, was mild and favorable for business, until after the twentieth, and the change was so sudden and unexpected as to prevent a great amount of property reaching its places of destination—to the great injury of its owners, and forwarders, and of the loss to the State of the toll upon it. Notwithstanding the early and unlooked for closing of navigation, more business has been done, and a greater amount of toll has been received on the Canals than in any former year.

The Commissioners will proceed to give a general statement of the principal repairs that have been made upon the Canals since the time included in their last annual report.

ERIE CANAL.

A new culvert has been constructed, to discharge the water from the weigh-lock at Albany into the Hudson river; of stone laid in hydraulic cement, one hundred and fifty feet in length, seven feet wide at the bottom, four and a half feet high, arched and covered with earth. The foot of the lock has been rebuilt and a culvert gate added, to facilitate the discharge of water. When the water in the river was high, it set up to this lock and prevented its use. To remedy this inconvenience, new irons to suspend the bed or cradle, on which boats rest, have been procured, made with screws to adjust the cradle to any desirable height. These irons, it is calculated, will answer for a weigh-lock after the canal is enlarged; and believed to be capable of sustaining a weight of one hundred and seventy tons.

From the head of the four locks above the Cohoes Falls, and including the first lock west of the aqueduct at the Little Falls:

During the past season the piers that support the trunk of the lower aqueduct across the Mohawk river, have been secured from the action of the frost, and the running ice in the river, by enclosing them with frames of timber, planked on the sides.—The work appears to have been done in a substantial manner, and the piers may be considered secure while the timber retains its strength.

On several of the short levels, and at other places below the locks, the force with which the water is discharged from the locks has broken the walls, and displaced the stone which had been put on the face of the bank as a protection. Timber on the top of the wall at some places, and docking at others, is found to be a good repair, and better than a wall of the ordinary description. For this purpose, 307 rods of Canal have been secured in the manner described.

On this section there have been erected 29 new bridges; several have been repaired and the covering renewed. The almost constant use of the paddle gates, renders this an expensive item in repairs, and last spring, 42 paddle gates and 10 culvert gates were put in the locks.

One breach has occurred on this section of the Canal in the last season. It interrupted the navigation about ten hours, and was repaired at an expense of about $200.

From the head of the locks at Little-Falls to New-London:

Much expense was incurred in clearing out the bottom of this line of Canal, principally on that part between the head of the lock at Frankfort and the city of Utica, a distance of about nine miles. This being the east end of the long level, and no important feeder nearer than Rome, it was often depressed, when the lockages were frequent, to the great inconvenience of navigators. The removing of the deposites from the bottom, and in several places excavating below the original bottom, have in a great measure removed this inconvenience.

The decayed state of the aqueduct at Rochester permitted a considerable quantity of water to filtrate through the joints, which had a tendency to hasten the decay of the stone in the parapet walls and arches. To obviate this, the trunk was lined with plank last spring, and it had the desired effect. The unfavorable operation of last winter and spring, on the stone in the aqueduct, produced a visible change; and so threatening was the aspect of one of the arches, that it was deemed necessary to raise a bent of timber under it, to render it secure. This arch is on the west side of the water course of the river, and the bent is secure from its floods.

Measures have for some time been in a state of preparation to rebuild the aqueduct, and the work would have been put under contract last spring, had it not become necessary to suspend the proceedings, until the question of enlargement was decided. The Commissioners are aware that the failure of this important appendage to the Erie Canal, in the season of navigation, might produce distressing consequences. This event is not expected the coming season; but it is thought that a proper regard for an uninterrupted navigation would justify the expense of procuring materials for a trunk of wood, in case the aqueduct should fail. These materials are in a state of preparation, to be delivered in the spring; and if the condition of the aqueduct then should render it necessary, the timber will be framed, the plank jointed, and every thing put in such a state of readiness as to occupy but a short time in fitting it for use.—If the event for which this preparation is made should not happen, but little damage would ensue, as the timber and plank could be disposed of, or used elsewhere on the Canal.

During the last season of navigation three breaches have occurred on this section of Canal. They caused but little interruption, and were repaired for $265 21.

The line from Lockport to Pendleton has, as usual, required heavy expenditures.—During last winter 8,283 cubic yards of earth were excavated preparatory to the reception of timber and plank, as a foundation for a heavy wall to sustain the lateral pressure of the bank. For this purpose there has been used 8,316 feet of timber, and 33,264 feet of plank. Stone wall to the amount of 6,720 cubic yards has been laid on this foundation, and as a guard against the action of the frost on the wall, 1,642 cubic yards of gravel was placed behind it.

This part of the canal is reported to be in a better condition than it has been for several years past, though the superintendent entertains some fears that the winter and spring may have an unfavorable influence on the navigation of next season, and the expense of repairs next spring.

The contracted channel of the Canal from Lockport to Pendleton, has for several years been insufficient to pass conveniently the quantity of water necessary to supply the Canal to the Seneca river. In order to force through this channel the desired quantity of water, the dam at the mouth of the Tonewanta creek has been maintained through the season of navigation six feet above the bottom of the Canal. This has an injurious effect on the low lands adjoining the stream.

The contemplated enlargement of the Canal should be commenced at this place, at an early period, in order that an adequate quantity of water may be sent forward from Lake Erie, the country redeemed from evils which have been mentioned, and the annual expenses for repairs diminished.

Repairs, other than those mentioned in this report, have been made upon this Canal, which, in the aggregate, amount to a large sum; but if stated singly, would appear of too trifling a character to find a place in an annual report. Great expense was incurred the last winter and spring, in removing obstructions from the bottom and sides of the Canal; and it is believed that a better and less interrupted navigation was maintained the last than in any previous season.

Pursuant to the act in relation to the Erie Canal, passed May 11, 1835, the Commissioners submit the following Report:

After the passage of this act, all proceedings under the act to provide for the improvement of the Canals of this State, passed May 6th, 1834, were suspended, except the payment of damages that had been appraised, and the construction of waste-weirs and races to carry water around locks.

A meeting of the Canal Board to take into consideration the act entitled "An act in relation to the Erie Canal," was held at the Comptroller's office, Canal Room, on the 30th June last, and on the 3d day of July, it was resolved by that Board, that the Canal Commissioners proceed without delay, to cause surveys and estimates to be made of all the improvements contemplated by said act. Pursuant to said resolution, surveys and estimates were made of the entire line of the Erie Canal, which were submitted to the Canal Board, at an adjourned meeting held for that purpose, on the 20th day of October; at this meeting, the question as to the dimensions to which the Canal and locks should be enlarged, was passed upon; some further surveys ordered, and an adjourned meeting was directed to be held on the 23d day of November. After this last meeting, it was too late in the season to commence the surveys with reference to location for locks. The proceedings of the Canal Board will be detailed in a report to be made by that Board, accompanied by the report and estimates of the engineers appointed to make the surveys.

The plan of a new aqueduct at Rochester was so intimately connected with the ques-

tion of enlargement that its re-construction was unavoidably suspended until the necessary surveys were made, and the question of enlargement decided. The importance of this work, and its decayed state, rendered it proper that there should be no unnecessary delay. A new location for the aqueduct has been decided upon by the Canal Board, and sealed proposals have been received for its construction, and also for culverts and excavation in the bed of the river, and excavation and embankments at each end of the aqueduct. No contract has yet been entered into for the construction of the aqueduct: the other work is under contract, and it is expected that a contract will soon be entered into with some of the persons proposing for the construction of the aqueduct.

The reasons for changing the location of the aqueduct will be detailed in the report of the Canal Board, and the report of the engineers before referred to.

The Commissioners intend that the surveys shall be commenced as early in the spring as the weather will permit; and as fast as the location of the locks can be made, to put them under contract. This proceeding will be extended from Albany to Syracuse.

The two first locks west of Palmyra, two of the three locks at Lockville, and one at Lyons, are in such a dilapidated condition as to render a reliance upon their use for any considerable length of time, very uncertain; and there can be no doubt as to the propriety of substituting new ones. It is intended to put these under contract as early next season as the necessary examinations can be completed, to be finished in the fall of 1837 or 38, as the appearance of the old locks next spring shall seem to render necessary.

The new locks on the line will be made on locations suitable for the eplarged Canal, and constructed on the plan of the enlarged locks. This rule will be adopted in reference to all new structures, as far forth as its application will be deemed beneficial to the State.

With a view to the improvement of the Erie Canal, the Commissioners have divided the line into four sections; to each of which they have assigned a chief engineer. Section No. 1 commences at the city of Albany and extends to the east end of the Rome summit, and is assigned to John B. Jervis: section No. 2 extends from the latter place to the west bounds of the village of Jordan, and is assigned to Holmes Hutchinson: section No. 3 extends from the latter place to, and includes the feeder from the Genesee river, and is assigned to Frederick C. Mills: and section No. 4 extends from the latter place to the termination of the Canal at Buffalo, and is assigned to Nathan S. Roberts.

The re-surveys, as has been before stated, will commence on all these sections early next spring, with the view of designating the exterior bounds of the Canal at as early a period as may be consistent and practicable. It is probable that in all the cities and villages the line may be permanently located in all the next season. This is deemed important, in reference to improvements which are constantly making at these places, and a special direction will be given to the surveys in reference to this object.

So far as the surveys made last season have developed the practicability of enlarging the Canal and executing a permanent work, without materially interrupting the navigation, nothing has appeared insurmountable, or more difficult than a cursory examination of the subject had indicated.—It is, however, a difficult, and in some respects, a fearful undertaking. The interference with private property, the immense expenditure, and the circumstances under which the work must be executed, will impose greater responsibilities, and require more mental and bodily exertions, than in the construction of an entire new work.—Experience has so far simplified and systematised the course of proceedings in the construction of new Canals, as to render the duty comparatively easy.

To plan and arrange the execution of the work appertaining to the enlargement of the Canal and a new set of lift locks, so that the parts which may be done during the season of navigation, and those which must be done in the winter, can be clearly delineated, in order that a basis may be furnished for a specific contract, will be no easy matter.

The economy of executing a public work depends very much on the manner in which the necessary arrangements are matured, previous to the execution of the contracts, in order that all work may be put at specific prices.

Great pains should be taken to perfect all the plans and locations; to point out the different kinds of work, and the circumstances under which it must be done; to enable the person offering for contracts to propose specfiic and intelligent prices, and to secure the navigation of the Canal from the chance of interruption. Under such circumstances the person proposing is enabled to fix proper prices, and can have no reasonable excuse, if from competition or any other cause, he is induced to enter into contracts for an inadequate compensation. This often occurs, and is the source of unpleasant embarrassments in the execution of a public work, as well in regard to its faithful performance as its progress. If the plans and locations are not well matured, it necessarily leads to alterations during the progress of the work, and generally imposes on the contractor extra expenses, for which he should be fairly and fully indemnified.—For these expenses the contractor has no prices, and generally no provision in his contract that indicates the rate of compensation. This state of things often excites the cupidity of a contractor, from an inordinate desire for gain, or to cover losses under a bad contract, to claim an allowance unjust and improper. Work, of the description which has been mentioned, is often done under circumstances which renders it difficult to ascertain the expense; and to liquidate accounts of this kind is always very embarrassing. It is, however, proper to remark, that notwithstanding all practical circumspection is exercised, the necessity of altering plans and changing locations sometimes occurs, for causes which canno be foreseen.

There have been instances where contractors have failed in paying laborers in their employ. A great portion of the laborers on our public works are foreigners, who are not aware of the protection afforded them by the laws of our country. They are generally poor and destitute, relying on their wages for their daily subsistence of themselves and families. The laborer, in all situations, is "worthy of his hire," and to withhold it under such circumstances, is exceedingly cruel and unjust.

In undertaking the extensive improvements on the Erie Canal, it may be deemed expedient to incorporate a provision in the contracts, giving the Commissioners some control over this matter.

The failure of contractors to pay their men, aside from its gross injustice, has a very unfavorable effect on the progress of the work, and enhances its cost. It affects the character of the work, and the interest of all the contractors. These laborers cannot readily ascertain the character and solvency of the contractors, and if one contractor fails in paying his men, it creates a fear and suspicion, which affects all.—The information passes from one friend to another, it spreads beyond the borders of the State, exerts a great influence in preventing laborers from coming to a public work, where they are not honestly paid.

The prohibition of sub-contracting will do much to remedy this evil.

CHAMPLAIN CANAL.

Last summer the Saratoga dam was bracketed before the usual time for low water. The brackets were of plank, 17 inches high: the pond readily filled, and the water in it was at all times during the season of navigation, above top water line in the Canal below the guard lock; but boats were frequently aground on the bottom of the Canal below Johnson's bridge. This was occasioned in part by bars formed in the Canal at narrow places, by the irregular supply of water that could be passed through the lock to feed the Canal when the lockages were frequent, and by some parts of the Canal in rock cutting, below the guard-lock not having been excavated to bottom. To remedy this inconvenience, it is intended during the winter, to remove the bars, excavate the bottom and sides of the Canal in the narrow and shallow places, and construct a water-way to pass water round the lock to feed the levels below it.

The discharge lock at Saratoga is founded on quicksand. The water passed under and along the sides of it twice last summer. A part of the embankment was taken out and replaced with better materials; but there have since been leaks discovered, and it is believed that the safety of the work requires that a thorough repair should be made before the opening of navigation.

In a time of low water in the Hudson river last summer, the water in the pond above the Fort-Miller dam, was lower than the top water line in the Canal. A set of reverse gates were constructed in the feeder south of the guard-lock, to retain the water in the Canal to its proper elevation. Un-

less the dam is raised, it will be necessary to construct another set of gates, to use the feeder for navigation at times of low water in the river.

The sliding bank at Hinman's Point requires protection. The bank is principally of clay, resting on slate rock, inclining towards the river, which washes the embankment. Piles cannot be driven to afford any security on account of the rock. It will therefore be necessary to place a pier of wood at the foot of the embankment, firmly resting upon and securely bolted to the rock and filled with stone.

Piles have been driven to secure the towing-path from sliding south of Stuart's. It will be necessary to extend this work next season. A new trunk is required for the Fort-Edward aqueduct.

An additional paddle-gate, three feet square, has been put in the Fort-Edward lock, to facilitate the lockages; and a slide-gate has been put in the sluice by the side of the lock, to pass water from the feeder to the level below it. The walls of this lock have moved inwards, and at some points are but thirteen feet two inches apart. From this, and the imperfect state of the masonry generally, it has become necessary to rebuild it before the commencement of navigation.

The waste-weir at Smith's basin and the one near Holmes', on the summit level of this Canal, have been rebuilt of permanent stone masonry. The bridges over them are formed of large flat stone, covered with gravel, resting on stone abutments and piers, from three to four feet apart; slide and roll-gates are inserted in a frame work constructed immediately below the piers, connected with and well secured in the abutments at the ends, and supported at the centre by a stone buttress. The water wastes over the frame and preserves the timber from decay. That at Smith's basin is now in use. At the other place, the old waste-weir is to be taken out, the space filled with earth, the towing-path straightened, some embankment to be removed from the front of the new weir, and docking put in at the ends of it.

The repairs contemplated in the last annual report of the Commissioners, to the locks at Whitehall, were not made last spring on account of unfavorable weather for work of that kind. The materials are on hand, and if the weather is favorable, the work will be done next spring.

Breaches have frequently occurred in the embankment, and dry wall constructed for the protection of the Canal above these locks. The expense of repairing breaches, the contracted width of the Canal at this place, and the importance of maintaining an uninterrupted navigation, require that a substantial plan of improvement should be adopted.—the public works at this point are limited on one side by Wood creek, and by one of the streets of the village on the other. The utmost extent of ground that can be occupied for the Canal, without encroaching upon the channel necessary for the creek, or taking a part of the street, is too circumscribed to admit of making an embankment of earth for the whole distance. It will therefore be necessary to continue a wall of cemented stone masonry, from the present wall at the head of the locks, about 210 feet, and make an embankment of earth, protected on the outside by a slope wall about 700 feet in length. If this was done, a waste-weir necessary to regulate the water on this level, might be built in the wall above the locks, to discharge water into the bed of the creek.

At the head of the Glen's Falls feeder, a guard lock of hammered stone has been built on the north side of the old lock of wood, that had become unfit for use. About 350 yards of earth and 400 of rock are to be excavated, to complete the entrance at the head and foot of the lock. This work is in progress and will shortly be finished.

A breach occurred in this feeder on the 26th of July last, in the high embankment above the village of Glen's Falls. It was repaired at the expense of about three hundred and fifty dollars.

The locks on the feeder are of wood; there are thirteen, numbered from 8 to 20 inclusive. Seven have received repairs the past season.

The navigation on the feeder is greatly delayed for want of sluices, or water-ways to pass water round the locks to feed the Canal. The water has to be passed through the locks, and cannot be drawn in sufficient quantities, when they are much used for passing floats. Much inconvenience has resulted from the contracted width of the feeder at several places, particularly at the village of Glen's-Falls, where the largest amount of tonnage, transported in boats, is loaded and unloaded. About 1,600 floats have passed through these locks the last season.

The Commissioners, in their last annual report, at page 22, stated that an examination of the Glen's-Falls feeder had been made by Holmes Hutchinson, Esq. His report will be found appended to their report and marked D. The Legislature is respectfully referred to these reports. They were made under the expectation that legislative direction would be given in relation to this feeder. After the adjournment of the Legislature, without acting upon this subject the Commissioner having charge of this line of Canal did not think he was authorized to make the improvements recommended in the report of Mr. Hutchinson, in the course of ordinary repairs. He submitted the question to the Canal Board, and they advised him by resolution, to suspend the rebuilding of the lift locks on the Glen's-Falls feeder, until the Canal Commissioners have an opportunity to submit the question as to rebuilding said locks, to the Legislature.—The Commissioners are of opinion that they do not possess the power to make the improvement recommended in the report of Mr. Hutchinson, under the authority given them to make ordinary repairs, for the reason that it would be necessary to make an additional appropriation of land; and that the Canal Board have not the authority to direct them to be made as extraordinary repairs, because the estimated expense exceeds thirty thousand dollars.

In the month of December last, Frederick C. Mills, civil engineer, was requested by the acting Commissioner to examine the Champlain Canal, Fort Edward dam, and Glen's-Falls feeder. He has made the examinations required, and reported the result. In his report in relation to the Glen's-Falls feeder, he says, "If the plan for improving this work, suggested in the report of Holmes Hutchinson, civil engineer, be adopted, which, from the cursory examination I have been permitted to make, I would recommend, or in case the feeder is barely maintained for the purposes of navigation, it is believed to be the superior economy to reconstruct the present locks, as they decay, of hammered stone masonry, laid in hydraulic cement."

The business upon this feeder is said to be increasing; and it is deemed important to a large section of country, that it should be continued in a navigable condition. To do this, it is necessary that the work of rebuilding the locks, should be commenced within a short time.

The Commissioners are of opinion that the feeder should be improved upon the plan generally, as recommended in the report of Mr. Hutchinson, perhaps varying in some of the details: but they submit the question to the Legislature, and respectfully ask their direction as to the manner of its repair or improvement.

(To be continued.)

RAILROADS IN WINTER.—It has been often urged as an objection against Railroads, that they cannot be kept open in winter, in consequence of the obstructions occasioned by great falls of snow. As if to furnish a satisfactory experiment upon this point, it has so happened that the present winter has been of unusual severity, and the quantity of snow that has fallen has probably been greater than has been known for many years. It is, therefore, with great pleasure that we understand scarcely any interruption to the travel upon the Railroads leading from this city has taken place, and that the practicability of keeping them open, during the severest winter, has been satisfactorily established. We have not heard, indeed, that the Washington or Ohio Railroad has been suspended for a single day, although undoubtedly the time of arrival and departure may have been occasionally varied. We perceive from the Boston papers, that, even in that climate, where the snow storms are so much more frequent than with us, and where the snow lies so much longer, no serious interruption to the use of the Railroads has occurred. There have been only six days, since the commencement of the winter, in which the train of passenger cars have not run through the whole distance from Boston to Worcester, and only eighteen days in which the whole four trips per day have not been regularly performed. In the meantime, the harbors, rivers, and Canals, far and near, have been frozen up and entirely useless.

BATH AND WEYMOUTH RAILWAY.—Messrs. Hopkins and Sons, Civil Engineers, of Plymouth, intend forthwith to produce a prospectus of a Railway from Bath to Weymouth, *via Ilchester*, at which latter place there is to be a branch Railway to Bridgewater, thereby uniting with that from Bristol to Exeter, and thus forming a communication from Weymouth to Bath and Bristol, which places will be in direct communication, by Railway, with Gloucester, Cheltenham, and Birmingham, as well as Liverpool.—[Jersey Star.]

AGRICULTURE, &c.

SHEEP HUSBANDRY—NO. III.

The Emigrant Merino.—There does not appear to be among those who write and converse on the Saxony and Merino sheep, a distinct and definite understanding of the subject. By most people they are regarded as distinct races of sheep; and designated by many imaginary distinctions.

To whatever region the Spanish Merino has emigrated, he is to be identified with the original, like the greyhound. Thence arises the inquiry, where has he been preserved in the greatest purity? held in the highest estimation and cultivated with the most care? in Saxony, France or America? And when we talk about *old fashioned Merino sheep*, it must at the same time be understood, that one variety of the parent stock is four times as valuable as others, and that this necessarily influences the emigrant, and determines his value. Then comes the consideration of individual peculiarity and excellence, which forms the basis of improvement, and the preservation of his purity.

The first emigration of the Spanish merino with which we have any acquaintance, was to Saxony; whose history has been partially narrated in the first number.

The second was to France, in both instances under circumstances of sovereign or state patronage. This second I shall furnish principally from a transcript of the writings of others.

"When France became a manufacturing, as well as an agricultural nation, it was perceived how great an injury she sustained by being dependent on foreigners for all the fine wool which she employed, and it was well understood how great would be the advantages which she would derive from the production of it within herself.

"This subject occupied the serious attention of Colbert, whom nothing escaped which might tend to the advantage and greatness of his country—he projected a change in the system which prevailed. Succeeding ministers attempted without effect to put his designs in execution.

"It was not until the year 1766, that Daniel Charles de Trudaine, an able minister, employed the surest means of succeeding, and thus freeing the kingdom from the tribute which it paid to procure fine wool. After his death, his place was supplied by his son, who followed the plan laid down by him. Daniel Charles de Trudaine had addressed himself, not to cultivators of land, whom narrow views and prejudices are too apt to deter from adopting whatever they have not seen practised by their forefathers, but to Daubenton, an able naturalist, who instantly perceived the possibility of what was proposed, and proved it by satisfactory experiments."

"It having been ascertained by a variety of experiments patronized by the administration, and conducted by enlightened agriculturists, that the Merino sheep might be acclimated in France without any change in their wool; application was made by Lewis sixteenth to the King of Spain for permission to export from thence a number of Merinos. This was not only granted, but orders were given by the Spanish monarch that they should be selected from the finest flocks in Spain. In the year 1786 four hundred rams and ewes arrived in France under the care of Spanish shepherds. Fortunately for France, the improvement in sheep, begun under Lewis the sixteenth, was continued through the revolution, in which almost every other useful institution was involved in ruin. A committee of agriculture was formed in the Convention, and under their protection the amelioration of the Merino flocks happily progressed. From this originated the celebrated Rambouilet flock. From this, the writer says a number of rams and ewes are annually sold, after the finest are picked out to keep up the original stock. And notwithstanding the annual sales from the national flocks, the price of rams is daily increasing."

So particular have the governments of Saxony and France been, to preserve these flocks from degenerating, and to effect every possible improvement, that they have at different times sent experienced shepherds into Spain, to select from their choice flocks superior individual rams, for which, in some instances, they have paid enormous prices, to preserve the necessary change without breeding in and in.

In such high consideration was this subject held by the successive administrations of the French government, that a commission was issued to the institute, to appoint a committee to prepare a treatise on sheep; which was executed, and distributed gratuitously, with that characteristic liberality of the great nation, which has done so much in science, and in arousing the dormant energies of the human mind, to a positive exaltation of character.

Mr. Gilbert, a member of the French national institute, in describing the Rambouilet flock, says, "but which certainly does not yield in any circumstance to the most beautiful in point of size, form and strength; or in fineness, length, softness, strength, and abundance of fleece. The manufacturers and dealers in wool, who came in numbers, to Rambouilet this year (1796) to purchase, unanimously agreed to this fact, at the very time that they were combining to keep down the price." He further states, that the average weight of the fleeces of the bucks, when washed and scoured, exclusive of tags and belly wool, was six lbs. In this country, for the market, we do not scour; only wash, and roll up the whole fleece. The amount of fleece is very much dependent on feed. He says, "the comparison I have made with the most scrupulous attention between this wool, and the highest priced, of that drawn from Spain, authorizes me to declare that of Rambouilet superior."

The Electoral flock of Saxony, and the Rambouilet flock of France, are of the same rank and degree—selected improved Merino. How is it then, when Saxony wool takes the precedence of Spanish wool in the market, that Rambouilet does not come in competition with Saxony? Spain and Saxony are pre-eminently fine wool growing regions; but neither of them extensively manufacturing; they grow for exportation. France, on the other hand, grows prime wool, which is consumed by her own unrivalled machinery.

In the third instance, he crossed the Atlantic for the new world, and landed on our shore. Here he was greeted with an enthusiasm bordering on distraction, and which can now hardly be realized. In the year 1802, the Hon. Robert R. Livingston of this State, with a discriminating patriotism meriting national reminiscence and gratitude, sent from Spain two couple of select Spanish Merino sheep, the first ever brought to his country.* Subsequently by himself, Col. Humphrey, Gen. Derby, Consul Jarvis and others, the country was supplied with Merino sheep.

Manufactories were now established, and the production of fine wool promised to be a lucrative business. But these prospects were soon dissipated, and upset, by the versatility of our own government. And the choice Merino buck fell from the exalted sale of $1,400 to the degraded estimate of 2 or 3 dollars. In the year 1813 I paid $150 for a Paulaur buck, and $100 each for six ewes. In the year 1827 I bought the remnants of some choice Escurial flocks, which had formerly been purchased at $200 each, for $2.50 each. And such was the depressed price of wool, that I purchased in the year 1826, cash payment at auction, a package of full blood Merino wool, at 25 cents per lb., and after keeping it two months, I sold it on a credit of 90 days, for 24 cents per lb.

This extreme vascillation of public sentiment, prostrated the whole interest. Many individuals were involved in total ruin; and small proprietors abandoned the concern. A few, relying on the sufficiency of their own pecuniary resources, on the intrinsic worth of the animal, the estimate of the whole civilized world, for centuries, of its value, only awaited a more protracted exit. From all this, it is plain that there was almost an entire abandonment of the Merino in this country.

The result of scientific investigation is, that a conclusion cannot be come at without the whole sheet of facts, embracing the subject in all its connexions.

The establishment of facts by experiments involves almost infinite nicety; requiring the whole amount of human discrimination --unshackled by subsisting theories, preconceived notions, and pride of popularity. An opinion is a mere nullity, separated from the considerations necessary for its formation. And the experience of every day exhibits the imperfection and fallacy of experiments and opinions. Not only the preceding narrative, but the most scrupulous investigation, will concur in the establishment of the subsequent statement.

The Spanish Merino has hitherto furnished the best material for the fabrication of fine woollen clothing; and as a natural consequence and matter of fact, has rendered all Europe tributary to her production.

This sheep being transported to Saxony and France, and there received as an acquisition, its peculiar character duly appreciated, nursed with care, preserved in its purity, proved in its excellence—must stand pre-eminent.

Sheep are a defenceless and delicate animal, the prey of wolves and dogs, and subjects of disease; therefore in a domesticated state, requiring the protecting and fostering care of man. And in following the destinies of their itinerant master, are necessarily subjects of acclimation.

The Spanish Merinos, with their gradations, have passed this ordeal in our country. The Saxony Merino have not in point of time been allowed the same courtesy and indulgence.

Who then, permit me to ask, who, in defiance of the light of science, and the experience of the world for a century, will be disposed to retrograde? Now what shall we do with this chimney corner and barn yard phrase, "*old fashioned Merino?*" I am as fond of antiquity as any one else, but I am unwilling to indulge this taste, at the sacrifice of a distinctive perception of things.

F.

*We beg leave here to state, that the FIRST Spanish sheep were sent to this country in 1801, by M. Delessert, of Paris, one only of which, Don Pedro, figured in the first volume of the Cultivator, page 183, lived to reach land. Don Pedro was kept some time in Ulster county, and afterwards by Mr. Dupont, in the State of Delaware.

Wool, the coat of the sheep, will be the subject of the next No.

P. S.—Permit me to commend the letter of Leonard Jarvis, Esq., in the last Cultivator, from the New-York Farmer, written with much ability and great fairness. It is from such sources that we are to take information. For scientific examination and investigation cannot be profitably prosecuted in an obstinate and controversial way.

"But man we find the only creature
Who, led by folly, combats nature;
Who, when she loudly cries, forbear—
With obstinacy fixes there." SWIFT.

From the New-England Farmer.

ATTENTION TO STOCK.

Care and skill are as indispensable as industry to success in the pursuits of the husbandman; and diligence will be of little use, if not directed by knowledge and good sense. An apparently trivial mistake, or want of attention to little but indispensable things, may rob labor of a great part of its efficacy, and seem to show that there is some mistake in the wise saying that "the hand of the diligent maketh rich." In fact, it is vain to *work hard* unless we *work it right*. This is the reason that the stock of some hard working farmers always appear in poor condition, notwithstanding they may be liberally supplied with fodder of the best quality.

Cattle must not only be well fed, but must have their food in due season; and likewise good water at command, and dry lodging. "Nothing," says an old English writer, "in winter, beats out cows and oxen, or makes them pitch [fall away] more, than their being WET ON THEIR BACK AND LOINS; for cattle carrying their hides wet, day after day, is as bad to them as it would be to us to wear wet clothes. The same injury arises to poor straw fed cattle, working in wet weather; one day's work in such case injuring them more than three of equal labor in dry weather."

"Cattle well *summered*," says Mr. Lisle, "are half *wintered;* that is to say, cattle going to their winter's quarters in high condition, will preserve a good plight throughout the winter; whereas such as have been fed upon short commons during the summer, and go to hay in a weak condition, are liable to become worse or even to drop off in the winter, particularly if it be unfavorable. Very young cattle and old cows are the most dangerous stock under these circumstances." Mr. Lawrence, in commenting on this paragraph, says, "to the above well grounded position may be added: Cattle well wintered are half summered; they are able to encounter either extreme of rank and surfeiting, or low summer keeping with greater safety than weak half-starved cattle."

It is very proper, and indeed almost indispensable, that every farmer should keep an account of the time when his cows are driven to the male. Mr. Lawrence says—"The period of *gestation* with the cow having a bull calf is, according to my own account, *two hundred and eighty-seven days*, or forty-one weeks, with the variation of a few days, either way; a cow calf comes in about a week's less time." Mr. Lisle says, that a "cow should be dried within two months of her calving, as to milk longer most necessarily impoverishes both cow and calf to a greater amount than the value of the milk."

Monk's *Agricultural Dictionary*, an English work of reputation, gives the following recipe for drying cows, which it is intended to fatten, or which have approached so nigh to the time of their calving, that it is thought improper to milk them any longer.

"Take an ounce of powdered alum; boil it in two quarts of milk till it turns into whey; then take a large handful of sage, and boil it in the whey till you reduce it to one quart; rub her udder with a little of it, and give her the rest by way of drink; milk her clean before you give it to her; and as you see need requires it, repeat it. Draw a little milk from her every second or third day, lest her udder be overcharged."

The same writer asserts, that "those cows which give the greatest quantity of milk are most profitable for suckling calves, for rich milk is not so proper food for calves as milk which is less valuable for dairy purposes. Milk which contains a large proportion of cream is apt to clog the stomachs of calves; obstructions put a stop to their thriving, and sometimes prove fatal. For this reason, calves should be fed with the milk which first comes from the cow, which is not so rich as that which is last drawn."

We have had the testimony of a very judicious practical cultivator to confirm the assertions in the paragraph last above quoted, who informs us that he has ascertained by actual and repeated experiment, that those cows which give the poorest milk for the dairy are the best for suckling calves.

"No, calf, lamb, or other animal," says Mr. Leslie, "should ever be caught *by the tail*, as it strains and inflames the loins and kidneys."

The first calf of a heifer is said to be the best for rearing; and the reason assigned is, that the dam is not reduced by milking her while she is with calf.

From the Genesee Farmer.

TRANSPLANTING FRUIT TREES.—This is commonly considered as one of the most difficult operations in the culture of fruit trees; but if properly performed is very rarely attended with any difficulty or risk. It is a very common opinion that a transplanted tree must of necessity continue nearly stationary in its growth for a year or two after the operation, or at best make but comparatively little progress. A tree, however, *properly* transplanted, will experience very little check in its growth, and often apparently none. Hence, the very great importance of the operation being well understood. Much has been written in explanation of the theory of successful transplanting; but we merely intended here to give a brief description of the practice which experience has proved to be uniformly attended with success, and the most obvious principles on which it is founded.

There are two great points to be observed in removing trees from the soil; first, to preserve the spongioles uninjured; and secondly, to prevent evaporation, by which the tree becomes dry, and if carried to excess, beyond recovery.

1. *Preservation of the Spongioles.*—These are the minute spongy extremities of the finest fibrous or branching thread-like roots, through which, as mouths, the tree receives fluids and other nourishment from the soil, and not through the surface and sides of the roots, as is sometimes supposed. As these spongioles are exceedingly delicate in their organization, a very slight degree of violence injures or destroys them. The more carefully, therefore, trees are removed from the soil, and the more entire the fibrous roots, the greater will be the number of uninjured spongioles remaining, and better will the tree be supplied with nourishment after it is planted again in the soil. And hence the absurdity of the practice, which has been recommended by some writers, of cutting off most of the small fibrous roots, because they cannot be easily replaced in their natural position in the soil.

2. *In order to prevent evaporation*, the roots should never be suffered to become dry, but as soon as removed from the ground, they should be enveloped in some damp substance; wetted straw serves well for a temporary protection. But when intended to be conveyed to a distance, and there is a probability of their being several days out of the ground, damp moss should be employed in packing about the roots, as straw is liable to ferment, if kept in a wet state. Previously to packing them in the moss, it is an excellent practice to immerse the roots in soft mud or a mixture of the soil and water, so as to coat their surfaces, after which dust or dry sand is sprinkled copiously over them to complete the coating.

The *holes* for receiving the trees should be dug large—not less than five or six feet in diameter, at the very least, and eighteen inches deep. The hard and sterile subsoil should be thrown out, and its place supplied with rich mould or muck. Where the holes are dug in ground in grass, the turf which is removed from the surface may be inverted in the bottoms. If manure is placed in them, it should be well rotted, and should never be allowed to come in contact with the roots, but should be placed in the bottom, at the surface, and in the more remote parts. The tree should in general be set a little deeper than it originally stood, but not more than two inches; the roots should be spread out horizontally in all directions, so as firmly to brace the trees when they become large; moderately moist and finely pulverized earth should then be gently shaken in about them, so as not to disturb the position of the fibres, until the whole is filled. Care should be taken that all the interstices among the roots are perfectly filled, so as not to leave the smallest cavities; and throwing in the earth in large quantities should for this reason be especially avoided. In order that the soil may be gently packed on every side of all the roots, it is very useful, when the soil is inclining to dryness, to pour in a quantity of water as soon as the roots are covered, and then the remainder of the earth shovelled in, which latter prevents the surface from becoming hard by baking. After the operation is finished, a stake should be set in the ground leaning towards the tree, to which it should be tied by a band of matting or of straw, to brace it firmly in an upright position.

Placing the tree leaning a little towards the south or southwest, or with the most projecting branches in that direction, will prevent the trunk being injured by the action of the rays of the sun in hot summer afternoons, an evil which is sometimes so serious as to cause the death of the tree.

Autumn is ordinarily the best time for removing trees; more time is then afforded than in the hurrying season of spring—besides which the earth becomes more settled about the roots, and new spongioles are produced in place of those which may have been destroyed, especially if the operation is not performed till late in autumn. Better trees also may be obtained in autumn than in spring after nurseries have been culled. But if tender kinds be transplanted in the fall, and particularly if they be removed to a colder section of the country, they will, from their mutilated state, be more liable to injury from frost. To those,

therefore, who live remote, and are unable to obtain such trees for early planting in the spring, or those who live in the colder regions of the country, we would recommend to procure their trees in autumn, and bury the roots and a part of the stem and branches in a trench dug for the purpose, the roots being packed closely together, and the branches resting in an inclined position upon the earth; which operation is technically termed by nurserymen, *laying in by the heel.* In this way they may be effectually protected from injury from the frosts of winter.

Nothing is more common than to loose trees by transplanting; but there is no necessity for such a failure; if trees are transplanted with proper care, there will be an almost absolute certainty of their living. If, when they are taken from the earth, care is taken to remove the roots entire—to keep them fresh—and in replacing them in the soil, to pack finely pulverized earth well about the roots, preserving them in their natural position, there can be little danger of success.

But it is not only necessary the trees should *live*, but they should thrive also; and for this object, it is indispensably requisite that they should have a large deep bed of loose soil for the roots to penetrate. If the ground is of a hard or heavy nature, the holes must be made large and deep, and filled with the proper materials, for if the roots are confined in small holes dug in such ground, they will succeed little better than if planted in a small box of earth.

Extract from a young Baltimorean visiting England on business connected with the New-Orleans and Nashville Railroad.

London, Dec. 7, 1835.

DEAR SIR,—The Railroad fever is raging to a greater extent here than with us; the papers are all teeming with projects to connect places where only a few hours can be saved, which strongly tends to convince us of the importance of a speedy connexion, by means of steam power, between Boston and New-Orleans, which would create a saving of almost weeks. It is almost incredible the extent to which steam is used here; in Manchester alone there are twelve hundred engines in active operation, and one is at a loss to determine how England ever could have sustained herself without that which she is now so completely dependent upon. The greater portion of our time has been spent among the Iron manufactures in South Wales, some of which are conducted on a most stupendous scale; there is one establishment that employs five thousand men, and consumes weekly five thousand tons of coal; and from what I have seen of the whole country, I think the march of improvement is equally as progressive as our own.

A NEW PAPER-HANGING, of a splendid description, has just been manufactured by Mr. De la Rue, the embossed-card manufacturer, who has been for many years at a considerable expense in bringing it to perfection. The pattern is embossed; in metals it is remarkably rich, particularly so with a flock ground. I was favored with a view of a room that has been recently hung with this new paper, at the manufactory in Bunhill-fields, and was very much struck with it. The pattern was embossed in gold, with a dark green flock ground, and the effect produced was magnificent. Another pattern is in imitation of a very richly embroidered shot-silk. A specimen of this paper has been submitted to his Majesty, who was very much pleased with its splendid appearance. The price varies from 1*s.* 8*d.* to 2*s.* per yard; and in metal, from 2*s.* 6*d.* to 3*s.* 6*d.* per yard, according to the pattern.—[Mr. Laxton; Archit. Mag.]

EMANCIPATED SLAVES.—A few days since, an aged gentleman from Pawhattan county, Va., arrived at Rochester, accompanied by ten negroes, from six to forty years of age, formerly his slaves, whom he had voluntarily discharged from servitude, and was conveying to a farm he had purchased for them in the neighborhood of Buffalo, on which he intended to settle them.